ЗАКЛЮЧИТЕЛЬНЫЙ ОТЧЕТ

МСЭ-D 2-Я ИССЛЕДОВАТЕЛЬСКАЯ КОМИССИЯ

ВОПРОС 14-3/2

ИНФОРМАЦИЯ И ЭЛЕКТРОСВЯЗЬ/ИКТ ДЛЯ ЭЛЕКТРОННОГО ЗДРАВООХРАНЕНИЯ

5-Й ИССЛЕДОВАТЕЛЬСКИЙ ПЕРИОД 2010-2014 Г.

Сектор развития электросвязи

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ВОПРОС 14-3/2:

Информация и электросвязь/ИКТ для электронного здравоохранения

Исследовательские комиссии МСЭ-D

Для обеспечения выполнения программы по обмену знаниями и созданию потенциала Бюро развития электросвязи исследовательские комиссии МСЭ-D оказывают поддержку странам в достижении ими своих целей развития. Выступая в качестве катализатора в создании, применении знаний и обмене знаниями в области ИКТ в целях сокращения масштабов нищеты и обеспечения социально-экономического развития; исследовательские комиссии МСЭ-D помогают стимулировать создание в Государствах-Членах условий для использования знаний для более эффективного достижения целей развития.

Платформа знаний

Результаты работы, согласованные в исследовательских комиссиях МСЭ-D, и соответствующие справочные материалы используются в качестве исходных документов при реализации политики, стратегий, проектов и специальных инициатив в 193 Государствах − Членах МСЭ. Эти виды деятельности служат также для укрепления базы совместно используемых знаний Членов МСЭ.

Платформа для обмена информацией и знаниями

Обмен темами, представляющими общий интерес, осуществляется путем участия в очных собраниях, на электронном форуме, а также путем дистанционного участия в атмосфере, благоприятной для открытого обсуждения и обмена информацией.

Хранилище информации

Отчеты, руководящие указания, примеры передового опыта и Рекомендации разработаны на основе вкладов, поступивших для рассмотрения членами комиссий. Информация собрана путем обследований, вкладов и исследований конкретных случаев и доступна для Членов, использующих средства управления информационными ресурсами и веб-публикаций.

2-я Исследовательская комиссия

ВРКЭ-10 поручила 2-й Исследовательской комиссии исследование девяти Вопросов в области информационно-коммуникационной инфраструктуры и развития технологий, электросвязи в чрезвычайных ситуациях и адаптации к изменению климата. Основными направлениями работы стали исследования методов и подходов, которые в наибольшей мере соответствуют предоставлению услуг при планировании, разработке, внедрении, эксплуатации, техническом обслуживании и поддержке услуг электросвязи/ИКТ и дают наилучшие результаты, а также повышают ценность этих услуг для пользователей. В этой работе особое значение придается широкополосным сетям, подвижной радиосвязи и электросвязи/ИКТ для сельских и отдаленных районов, потребностям развивающихся стран в управлении использованием спектра, использованию ИКТ/электросвязи для смягчения воздействия изменения климата на развивающиеся страны, электросвязи/ИКТ для смягчения последствий стихийных бедствий и оказания помощи, проверке на соответствие и функциональную совместимость и электронным приложениям, причем основное внимание уделяется приложениям, поддерживаемым сетями электросвязи/ИКТ. Кроме того, работа была сосредоточена на внедрении информационно-коммуникационных технологий с учетом результатов исследований, проводимых МСЭ-R и МСЭ-T, и приоритетов развивающихся стран.

2-я Исследовательская комиссия совместно с 1-й Исследовательской комиссией МСЭ-R участвует в работе по Резолюции 9 (Пересм. ВКРЭ-10) "Участие стран, в особенности развивающихся стран, в управлении использованием спектра".

Настоящий отчет подготовлен многочисленными добровольцами из различных администраций и организаций. Упоминание конкретных компаний или видов продукции не является одобрением или рекомендацией МСЭ. Выраженные мнения принадлежат авторам и ни в коей мере не влекут обязательств со стороны МСЭ.

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1 Введение

1.1 Изложение ситуации

Электронное здравоохранение является сегодня одной из наиболее быстро развивающихся областей здравоохранения. Электронное здравоохранение – это комплексная система оказания медицинской помощи, в которой информационные технологии и технологии электросвязи заменяют непосредственный контакт между медицинским персоналом и пациентом. Оно включает многие приложения, такие как телемедицина, электронные медицинские карты, медицинские консультации на расстоянии, медицинские консультации между сельскими медицинскими центрами и городскими больницами и т. д. Электронное здравоохранение обеспечивает передачу, хранение и поиск медицинской информации в цифровой форме между врачами, медсестрами, другим медицинским персоналом и пациентами в клинических, образовательных и административных целях как на месте (вашем рабочем месте), так и на расстоянии (удаленные рабочие места). В некоторых развивающихся странах количество мобильных телефонов превысило количество фиксированных телефонов, а сеть подвижной электросвязи могла бы рассматриваться в качестве наиболее привлекательной платформы для внедрения услуг электронного здравоохранения.

Одной из важнейших частей системы электронного здравоохранения является более широкая экосистема продуктов и услуг, в которых используются широкополосные технологии и которые обеспечивают инновационные услуги, составляющие электронное здравоохранение. В рамках такой системы "интернет вещей" представляет собой концепцию, где каждая вещь интеллектуальна и соединяема – и это непосредственно обеспечивается с помощью эффективных, недорогих вычислительных мощностей. Они станут основным элементом более "умных" цифровых электронных продуктов, которые могут производить измерения, управлять бытовой электроникой и медицинским оборудованием и контролировать качество их работы. Персональные датчики, соединенные в сети, могут информировать медицинских работников о состоянии здоровья человека с помощью измерения уровня активности, сердечного ритма и уровня сахара в крови.

Всемирная организация здравоохранения составила сборник[1] медицинских решений и устройств электронного здравоохранения, которые особенно подходят в условиях нехватки ресурсов, когда многие люди неоправданно страдают от болезней в связи с трудностями в доступе к технологиям здравоохранения. Наряду с этим в докладе Межамериканского банка развития[2] рассматриваются возможные виды применения мобильного здравоохранения, причем основное внимание уделяется потенциальным перспективам в Латинской Америке.

В числе некоторых примеров можно отметить:

- Смартфоны, которые могут содействовать электронному здравоохранению, действуя в качестве центрального устройства для сбора, хранения и передачи информации, связанной со здоровьем человека. С расширением подборок данных о пациенте, работники здравоохранения озаботились тем, чтобы подчеркнуть важность безопасности данных и защиты данных, с тем чтобы пациенты могли быть уверены в том, что их медицинские карты

[1] http://who.int/ehealth/resources/compendium2012/en/index.html

[2] http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=1861959

надежны. В отчете МСЭ-Т о наблюдении за технологиями за 2012 год[3] излагаются некоторые принципы конфиденциальности, безопасности и сохранности как часть руководящих указаний по стандартам и функциональной совместимости в электронном здравоохранении.

- Недорогие и энергоэффективные вычислительные мощности, которые обеспечивают более длительный срок использования элементов питания, а потому надежность и рентабельность мониторинга при электронном здравоохранении. Это может снизить препятствия для выхода на рынок новых компаний, предоставляющих новые продукты и услуги электронного здравоохранения, позволяя поставщикам медицинских услуг в развивающихся странах получать выгоду от целого ряда инновационных услуг. Имеются и более широкие преимущества сокращения общего энергопотребления – это не только позволяет сдерживать рост стоимости, но и снижает нагрузку на местные и национальные электросети, необходимые для поставки энергии, которая обеспечивает возможность применения современных решений в области электронного здравоохранения.

Электронное здравоохранение играет очень важную роль в оказании медицинской помощи в развивающихся странах, где острая нехватка врачей, медсестер и фельдшеров прямо пропорциональна огромному неудовлетворенному спросу на медицинские услуги. В некоторых развивающихся странах уже были успешно реализованы небольшие экспериментальные проекты в области телемедицины, и там рассчитывают продолжить и далее эту деятельность, рассматривая вопрос о разработке генерального плана в области электронного здравоохранения, как это было рекомендовано в Резолюции WHA58.28 Всемирной организацией здравоохранения в мае 2005 года. В частности, Резолюция направлена на уменьшение различий между городскими и сельскими районами в отношении медицинских услуг, а особое внимание в ней уделяется наименее развитым странам, в том числе малым островным развивающимся государствам, развивающимся странам, не имеющим выхода к морю, и странам с переходной экономикой. Далее в настоящем отчете указанные выше страны будут называться "развивающимися странами".

1.2 Исследование Вопроса 14-3/2

В рамках Вопроса 14-3/2 основное внимание уделяется следующему:

- необходимые шаги для содействия в повышении уровня информированности директивных органов, регуляторных органов, операторов электросвязи, доноров и клиентов о роли информационных технологий и технологий электросвязи в совершенствовании оказания медицинской помощи в развивающихся странах;
- содействие сотрудничеству и обязательствам между сектором электросвязи и сектором здравоохранения в развивающихся странах в целях максимального использования ограниченных ресурсов обеими сторонами для внедрения услуг электронного здравоохранения;
- продолжение распространения опыта и передовых методов работы с использованием информационных технологий и технологий электросвязи в электронном здравоохранении в развивающихся странах;
- содействие сотрудничеству между развивающимися и развитыми странами в сфере мобильных решений и услуг электронного здравоохранения;
- стимулирование разработки технических стандартов для приложений электронного здравоохранения совместно с МСЭ-Т. В частности, разработка руководящих указаний для развивающихся стран о том, как пользоваться такими стандартами;
- внедрение и распространение технических стандартов МСЭ, касающихся электронного здравоохранения для развивающихся стран.

[3] http://www.outgrid.eu/public/outgrid/download/homepage/T230100001700001PDFE.pdf

Это Вопрос был первоначально утвержден ВКРЭ-98, а затем пересматривался на ВКРЭ-02, ВКРЭ-06 и ВКРЭ-10.

1.3 Миссия Вопроса 14-3/2

Миссия Вопроса 14-3/2 состоит в том, чтобы совершенствовать здравоохранение благодаря предоставлению Государствам – Членам МСЭ стратегической информации и руководящих указаний по эффективным практике, политике и стандартам в области электронного здравоохранения. Его задачи состоят в следующем:

- предоставлять своевременные и высококачественные сведения и информацию для того, чтобы помогать международным и национальным органам, ответственным за разработку политики и принятие решений, в определении способов совершенствования политики, практики и управления в области услуг электронного здравоохранения;
- повышать уровень информированности и обязательств международных и национальных органов, ответственных за разработку политики и принятие решений, а также частного сектора в отношении инвестирования в электронное здравоохранение и его совершенствования;
- осуществлять сбор, анализировать и распространять знания, связанные с электронным здравоохранением, в том числе результаты исследований, которые будут существенно содействовать совершенствованию здравоохранения с использованием ИКТ; и
- распространять с помощью обзора публикаций последующие ключевые темы исследований и практические достижения в области электронного здравоохранения, а также справочные документы для правительств и директивных органов.

1.4 Методы, используемые для исследования Вопроса 14-3/2

Источниками вкладов для Вопроса 14-3/2 были и являются:

- рассмотрение результатов исследований, проводимых членами в рамках Вопроса 14-3/2;
- проведение обследований;
- вклады от Государств-Членов и Членов Сектора, экспертов по приложениям электронного здравоохранения и т. д.

В рамках 2-й Исследовательской комиссии результаты работы по Вопросу 14-3/2 будут представляться через веб-сайт МСЭ-D.

Как было подчеркнуто выше, стратегическая цель этого Вопроса состоит в том, чтобы стимулировать сотрудничество между сообществом электросвязи/ИКТ и медицинским сообществом, между развитыми и развивающимися странами, а также между развивающимися странами. Кроме того, ожидается, что опыт, полученный в области использования электросвязи/ИКТ для приложений электронного здравоохранения в развивающихся странах, будет полезен для поставщиков оборудования и поставщиков услуг в развивающихся странах.

Прежде чем продолжить, важно пояснить, что означает выражение "развивающаяся страна".

1.5 Определение развивающейся страны

Развивающаяся страна[4], называемая также наименее развитой страной, – это страна с низким уровнем жизни, неразвитой промышленной базой и низким индексом развития человеческого

[4] Раздел 1.5-7 вклада: М. Йорданова[1], Л. Андрушко[2], [1]Институт космических исследований и технологий, Болгарская академия наук, Болгария, заместитель Докладчика[2], Международный университет в Женеве, Фонд Доминика, Швейцария, Докладчик по Вопросу 14-3/2 – Электросвязь в здравоохранении.

потенциала (ИРЧП) по сравнению с другими странами. Однако в системе Организации Объединенных Наций не существует принятого правила для обозначения "развитых" и "развивающихся" стран или районов. Общая практика в Организации Объединенных Наций (ООН) состоит в том, чтобы рассматривать в качестве "развитых" стран или регионов Японию в Азии, Канаду и Соединенные Штаты Америки в Северной Америке, Австралию и Новую Зеландию в Океании, а также Европу. В международной статистике торговли развитым регионом также считается Таможенный союз стран юга Африки и развитой страной – Израиль. Страны, появившиеся после распада бывшей Югославии, считаются развивающимися странами; а страны Восточной Европы и страны европейской части Содружества Независимых Государств не включены ни в развитые, ни в развивающиеся регионы.

Международный валютный фонд (МВФ) использует гибкую систему классификации, в которой учитывается: 1) уровень доходов на душу населения; 2) диверсификация экспорта, так что экспортеры нефти с высоким ВВП на душу населения не будут включены в классификацию стран с высоким уровнем развития, поскольку около 70% их экспорта приходится на нефть; и 3) уровень интеграции в мировую финансовую систему.

Всемирный банк классифицирует страны по трем группам доходов. Эта классификация устанавливается ежегодно 1 июля. На 1 июля 2011 года экономики были разделены согласно их валовому национальному доходу (ВНД) следующим образом:

- страны с низким доходом, у которых ВНД на душу населения составляет 1026 долл. США или менее;
- страны с более низким средним доходом, у которых ВНД на душу населения составляет от 1026 долл. США до 4036 долл. США;
- страны с более высоким средним доходом, у которых ВНД на душу населения составляет от 4036 долл. США до 12 476 долл. США; и
- страны с высоким доходом, у которых ВНД на душу населения превышает 12 476 долл. США.

Всемирный банк классифицирует страны с низким доходом и более низким средним доходом как развивающиеся страны, но отмечает: "Этот термин легко использовать; он не предназначен для того, чтобы означать, что все экономики в конкретной группе имеют одинаковый уровень развития или что другие экономики достигли более высокого или самого высокого уровня развития. Классификация на основе дохода не обязательно отражает состояние развития".

Изложенная выше информация является важной, и ее необходимо помнить, поскольку концепция оказания поддержки развивающимся странам является основной для Вопроса 14-3/2 и отчетов по этому Вопросу.

1.6 Важные аспекты

Эти аспекты всегда учитывались в обсуждениях, посвященных внедрению электронного здравоохранения, поскольку они могут как препятствовать развитию и широкому применению электронного здравоохранения, так и обусловливать их.

1.6.1 Краткое изложение крупных финансовых проблем и проблем в области здравоохранения в развивающихся странах

- Бремя болезней – отличается от развитых регионов;
- народонаселение – более молодое и быстро растущее по сравнению с развитыми регионами;
- медицинские услуги – неэффективные в связи с нехваткой как медицинских институтов, так и медицинских специалистов [1];
- расходы на здравоохранение – в разы меньше.

1.6.2 Цифровой разрыв

Цифровой разрыв является одной из основных проблем для тех, кто занимается планированием или пытается внедрять в развивающихся странах услуги электронного здравоохранения.

Что такое цифровой разрыв? Этот термин был внедрен в 1990-х годах [2] и относится к пропасти между теми, у кого имеются доступ и возможности использовать информационно-коммуникационные технологии, и теми, у кого их нет.

Для этого разрыва имеются многие причины – в первую очередь бедность, а также образование, грамотность, возраст, пол, культура, знакомство с ИКТ, географическое положение, инфраструктура, возможность установления соединений, ширина полосы и затраты на электросвязь. Цифровой разрыв существует не только между развитыми и развивающимися странами, но и внутри стран.

Цифровой разрыв считался препятствием для внедрения электронного здравоохранения в развивающемся мире и сельских районах развитого мира. Хотя о цифровом разрыве сказано было многое, ожидается, что инфраструктура и возможности установления соединений улучшатся, доступной станет дополнительная ширина полосы, снизятся затраты на технологии и связь и более широко будут использоваться мобильные телефоны, а цифровой разрыв уменьшится. В различной степени все это происходит в большей части развивающегося мира.

В замечательной статье М. Марса [3] показывается, что цифровой разрыв между развитыми и развивающимися странами за последние 10 лет не сократился, и поднимается вопрос о том, сократится ли он когда-либо. Теоретически должен сократиться, но на практике это мало возможно, поскольку технологии продолжают развиваться. Выводы экспертов по поводу того, исчезнет ли цифровой разрыв между развитыми и развивающимися странами, не обнадеживают.

Вот почему вся связанная с электронным здравоохранением деятельность в развивающихся странах должна быть основана на реалистичном понимании цифрового разрыва, его последствий и предопределяющих его факторов.

1.6.3 Подход, предполагающий копирование

В течение последних двух десятилетий в здравоохранении отмечены неудачи тысяч проектов в области телемедицины и электронного здравоохранения. Даже хорошо разработанные и работающие в развитых странах решения при их внедрении в развивающихся районах действовали плохо и проваливались.

Более чем очевидно, что подход, предполагающий копирование, не является оптимальным путем для широкого развития электронного здравоохранения. Решения, которые широко применяются в развитых странах, не всегда являются такими подходами, которые в действительности ищут развивающиеся страны или которые им настоятельно необходимы.

1.6.4 Местная культура и местные традиции

Несоблюдение местных традиций и культурных особенностей или, что еще хуже, грубое пренебрежение ими, может подорвать даже наиболее тщательно подготовленный бизнес-проект в области электронного здравоохранения.

Непременным условием является принятие в рамках определенной культуры каждой без исключения инициативы в области электронного здравоохранения.

1.7 Некоторое представление об электронном здравоохранении в развивающихся странах: обследование

Какова текущая ситуация с внедрением электронного здравоохранения в развивающихся странах? Ежегодно публикуются тысячи документов, отчетов и докладов. В каждом из них приводится доля информации о применении электронного здравоохранения в том или ином регионе, стране или сообществе. Одним из наиболее обширных обследований, проведенных за последние годы, является Глобальная обсерватория ВОЗ по электронному здравоохранению, где подытоживаются

результаты двух обследований, одно из которых было проведено в 2005 году, а другое – в 2009 году.

С 2009 года внедрение, принятие и знания об электронном здравоохранении изменились. Вот почему партнеры по Вопросу 14-3/2 решили провести в начале 2013 года подробное обследование. Это обследование проводится в форме онлайнового вопросника, представленного по адресу: https://www.surveymonkey.com/s/KSZTVMT. Основное внимание в вопроснике уделяется следующему:

- электронное здравоохранение в развивающихся районах и для них;
- по мнению представителей развивающихся стран, как МСЭ и в особенности Вопрос 14-3/2 могут способствовать более широкому внедрению электронного здравоохранения в их регионах.

С координаторами МСЭ связались и попросили их принять участие в обследовании, предоставляя информацию по их соответствующим странам.

В сотрудничестве со специалистами по электронному здравоохранению, которые принимают участие в Вопросе 14-3/2, при поддержке психологов и экспертов по этике был разработан инструмент обследования.

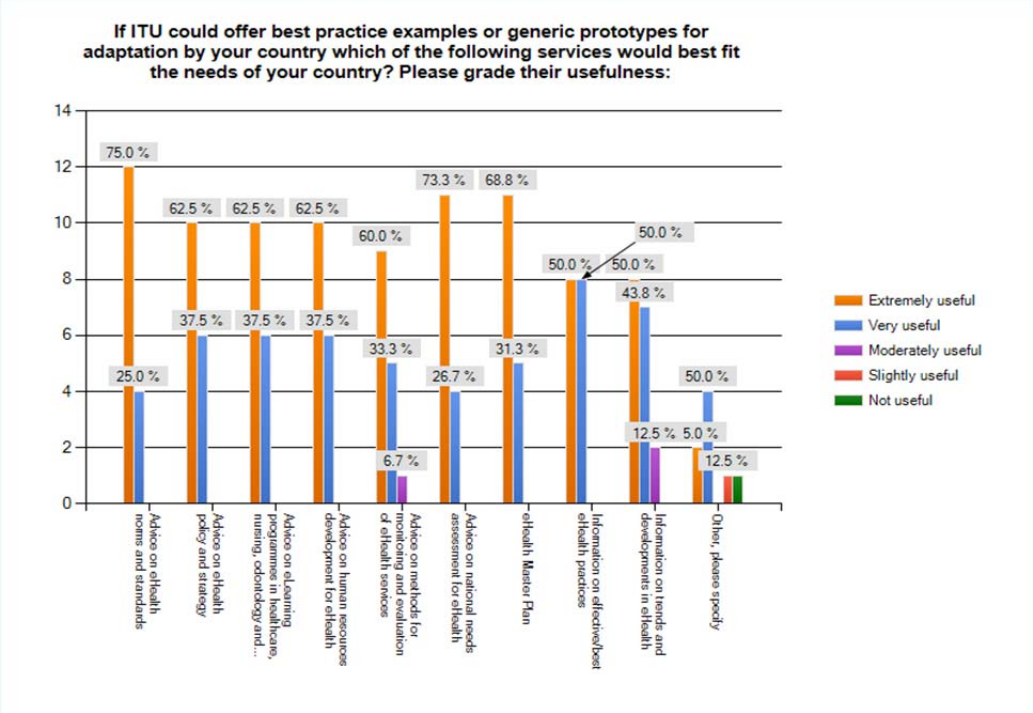
Ответы представили уже более 20 стран, и сбор данных продолжится. Полученные результаты свидетельствуют о том, что:

- 47% респондентов указали, что национальная стратегия в области электронного здравоохранения отсутствует;
- в странах, где такая стратегия имеется, в 90% случаев она частично внедрена;
- в качестве наиболее разработанных инструментов и услуг в области электронного здравоохранения указаны национальные реестры лекарственных средств, больничные информационные системы и телефонные справочники работников здравоохранения и медицинских учреждений. Как "наименее разработанные области" указаны телепсихиатрия, телерентгенология, надомный телеконтроль и мониторинг хронических болезней.

В ходе обследования также были выявлены проблемы с определением терминологии. Полученные результаты показывают, что если МСЭ смог бы предложить рекомендации и/или примеры передового опыта либо видовые прототипы для адаптации в развивающихся странах, услуги, лучше всего соответствующие потребностям этих стран, были бы следующими:

- рекомендации по нормам и стандартам электронного здравоохранения;
- генеральный план в области электронного здравоохранения;
- рекомендации по развитию людских ресурсов для электронного здравоохранения;
- рекомендации по программам электронного обучения в области здравоохранения, ухода за больными, стоматологии и клинической психологии;
- рекомендации по политике и стратегии в области электронного здравоохранения;
- рекомендации по методам мониторинга и оценки услуг электронного здравоохранения;
- информация по эффективной практике/передовой практике в области электронного здравоохранения;
- информация о тенденциях и изменениях в области электронного здравоохранения (Рисунок 1);
- обследование проводилось в онлайновой форме до середины 2013 года. В рамках Вопроса 14-3/2 было сделано все возможное для того, чтобы получить ответы от как можно большего количества развивающихся стран.

Рисунок 1: Пример из обследования 2013 года



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2 Некоторые руководящие указания по внедрению электронного здравоохранения в развивающихся странах

2.1 Относительно стандартизации в области электронного здравоохранения

[5]Предоставление эффективных и недорогих медицинских услуг является одной из проблем, с которой в настоящее время сталкиваются все страны, вне зависимости от того, являются ли они развитыми или развивающимися странами. Отрасль информации и электросвязи может в значительной степени способствовать здравоохранению в мире. Нет никаких сомнений в том, что внедрение услуг электронного здравоохранения принесет пользу всем странам, в особенности развивающимся странам, где не имеется ресурсов для совершенствования своих систем здравоохранения с использованием классического подхода увеличения количества медицинского персонала и больниц.

В результате усилий МСЭ вопрос о телемедицине для развивающихся стран был представлен и впервые обсуждался на первой Всемирной конференции по развитию электросвязи в Аргентине в марте 1994 года. Конференция утвердила Вопрос 6 (в 1998 году перенумерован в Вопрос 14) по телемедицине, который был поручен 2-й Исследовательской комиссии Сектора развития МСЭ. В соответствии с решениями Конференции МСЭ занимался различной деятельностью, связанной с исследованием потенциальных преимуществ приложений электронного здравоохранения для сектора здравоохранения развивающихся стран, а также с демонстрацией этих приложений в выполняемых экспериментальных проектах в области электронного здравоохранения/ телемедицины в отобранных странах.

Затем в Португалии с 30 июня по 4 июля 1997 года был проведен первый Всемирный симпозиум по телемедицине для развивающихся стран. Этот Симпозиум явился инициативой МСЭ и проводился по приглашению администрации электросвязи Португалии Институтом связи Португалии (ICP). В нем приняли участие более 57 стран, и это был первый случай, когда вместе собрались специалисты в области электросвязи и врачи из одних и тех же стран. Симпозиум явился первой возможностью, предоставленной развивающимся странам для того, чтобы ознакомиться с презентацией телемедицины, участвовать в обсуждениях с экспертами в областях здравоохранения и электросвязи и определить различные возможности и практические применения телемедицины в своих странах.

Всемирная организация здравоохранения в мае 2005 года на пятьдесят восьмой сессии Всемирной ассамблеи здравоохранения официально признала стратегию ВОЗ в области электронного здравоохранения и приняла Резолюцию WHA58.28, в которой устанавливается эта стратегия.

Как обычно для любых инновационных идей имеется множество препятствий, начиная от сопротивления медицинского персонала в развитых странах внедрению новых способов обслуживания и завершая отсутствием знаний в области электронного здравоохранения у медицинских специалистов и администраций в развивающихся странах.

Имеется еще одно крупное препятствие, которое касается как развитых, так и развивающихся стран – стандартизация электронного здравоохранения, которая является очень сложным вопросом. Несмотря на огромные затраты денежных средств и рабочей силы в этой области, полученный результат является довольно слабым, особенно в том что касается интересов развивающихся стран. Таким странам необходимо уделять особое внимание, чтобы удовлетворять

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[5] Вклад: Л. Андрушко[1], И. Накаджима[2], М. Йорданова[3], [1]Международный университет в Женеве, Фонд Доминика, Швейцария, Докладчик по Вопросу 14-3/2 – Электросвязь в здравоохранении; [2]Токайский университет, Медицинский факультет, Япония, заместитель Докладчика; [3]Институт космических исследований и технологий, Болгарская академия наук, Болгария, заместитель Докладчика.

их потребности с учетом состояния их сетей фиксированной и подвижной связи. Обеспечиваемые ИКТ решения для здравоохранения и услуг электронного здравоохранения, включая также мобильное здравоохранение, получили существенное развитие, особенно за последнее десятилетие. Но эти решения все еще слишком часто представляют собой изолированные островки в мелкомасштабных приложениях, которые не могут обеспечивать связь с другими медицинскими системами и/или осуществлять обмен информацией в различных географических местах и с использованием разных технологий.

Барьеры увеличению масштабов небольших систем в развивающихся странах препятствуют тому, чтобы оказывать помощь большему числу пациентов и поддерживать базу поставщиков медицинских услуг. Директивные органы не обязательно могут иметь доступ к информации о текущей ситуации в области здравоохранения, что, в свою очередь, тормозит комплексное планирование, ответные меры и формулирование политики.

Сектор стандартизации МСЭ занимается координацией работы по технической стандартизации мультимедийных систем и возможностей приложений электронного здравоохранения. Сектор недавно опубликовал новый Отчет о наблюдении за технологиями[6] , в котором рассматривается будущее электронного здравоохранения. В Отчете отмечается, что для развития электронного здравоохранения потребуются более универсальные стандарты для обеспечения функциональной совместимости в области электронного здравоохранения, стратегии преодоления связанных с технической инфраструктурой препятствий, а также необходимо будет рассматривать вопросы, связанные с конфиденциальностью, безопасностью и другими правовыми требованиями. Например, имеется множество общих стандартов, которые используются в приложениях электронного здравоохранения для кодирования изображений, безопасности, мультимедийной передачи и для разных языков. И многие из них были разработаны МСЭ-Т. Эти и другие вопросы рассматривались экспертами в рамках 16-й и 17-й Исследовательских комиссий МСЭ-Т, а также в других внешних органах по стандартизации. Необходимо, чтобы международные стандарты в области электронного здравоохранения были основаны на уже существующих "разработанных и стабильных технологиях", а не только на передовых технологиях будущего.

Полномочная конференция МСЭ 2010 года, проходившая в Гвадалахаре, Мексика, приняла новую резолюцию – Резолюцию 183 "Приложения электросвязи/ИКТ для электронного здравоохранения", в которой содержится призыв к МСЭ уделять первоочередное внимание расширению инициатив в области электросвязи/ИКТ для электронного здравоохранения и координировать связанную с электронным здравоохранением деятельность Секторов стандартизации, развития и радиосвязи и, в частности, содействовать повышению уровня осведомленности, выдвижению на первый план и созданию потенциала по разработке стандартов электросвязи/ИКТ в области электронного здравоохранения, сообщая в соответствующих случаях Совету о полученных результатах.

Помимо Резолюции 183, Полномочная конференция МСЭ в Гвадалахаре утвердила "Стратегический план Союза на 2012–2015 годы", в котором одной из стратегических задач МСЭ-Т названо "Преодоление разрыва в стандартизации: предоставление поддержки и помощи развивающимся странам в преодолении разрыва в стандартизации в том, что касается вопросов стандартизации, инфраструктуры и приложений информационных сетей и сетей связи, а также необходимых учебных материалов для создания потенциала, принимая во внимание характеристики среды электросвязи в развивающихся странах". Это касается технических стандартов электронного здравоохранения, подходящих для существующих сетей в развивающихся странах.

Кроме того, Всемирная конференция по развитию электросвязи, которая проходила в Хайдарабаде в 2010 году, утвердила Резолюцию 65 "Обеспечение лучшего доступа к службам здравоохранения путем использования информационно-коммуникационных технологий", в которой указывается, что следует продолжать "содействовать разработке стандартов электросвязи для сетевых решений в

6 www.itu.int/en/ITU-T/techwatch/Pages/ehealth-standards.aspx

области электронного здравоохранения и соединения с медицинскими устройствами в условиях развивающихся стран, в частности совместно с Сектором радиосвязи МСЭ и Сектором стандартизации электросвязи МСЭ".

Представленное ниже исследование конкретной ситуации показывает опыт Индии в создании национальных стандартов в области электронного здравоохранения и завершается определением некоторых извлеченных уроков и представлением рекомендаций другим развивающимся странам по созданию собственных национальных стандартов на основе существующих международных стандартов.

2.2 Стандартизация в области электронного здравоохранения – опыт одной из развивающихся стран

2.2.1 Введение

[7]Обеспечение базовых и минимально приемлемых медицинских услуг сельскому населению развивающихся стран постоянно вызывает проблемы. Среди прочего, причиной этого в существенной мере являются ограниченные ресурсы и неравномерное распределение работающих в больницах специалистов. Индия не является исключением в этом отношении, и при численности населения, превышающей миллиард человек, которые рассредоточены по отдаленным географическим местоположениям, появляются дополнительные проблемы в связи с обязательствами по обеспечению предписанных уровней оказания медицинских услуг. Вариант внедрения информационных технологий в области здравоохранения был одним из вопросов, изучавшихся, чтобы сделать процесс предоставления медицинских услуг более эффективным. В настоящее время множество государственных и частных поставщиков медицинских услуг работают в условиях изоляции при ограниченном взаимодействии между врачами или больницами и действуют как независимые структуры. При таком сценарии ощущается необходимость в принятии в стране стандартной системы медицинской информации, которая удовлетворяет потребности различных групп и способна обеспечивать для пациентов желаемые результаты.

В настоящее время во многих больницах частного и государственного секторов внедряются больничные информационные системы (HIS), использующие электронные медицинские карты. В рамках осуществляемых на экспериментальной основе правительствами штатов проектов информационных управленческих систем в области здравоохранения применяются устройства электронного доступа. Индия начинает делать успехи в области телемедицины и электронного здравоохранения. С более широким распространением в стране телемедицины, директивные органы в Индии убедились в том, что необходимо внедрять и постоянно дорабатывать рекомендованный набор стандартов и руководящих указаний по телемедицине, имея в виду быстро изменяющиеся сценарии повышения уровня достижимых стандартов в области здравоохранения. При наличии таких тенденций и наблюдая международные сценарии, особенно в отношении роста числа запатентованных систем, которые затрудняют обмен медицинской информацией в большинстве развивающихся стран, Департамент информационных технологий (DIT) предпринял инициативу по определению рамок для инфраструктуры информационных технологий для здравоохранения (ITIH) в Индии [1]. Одновременно с этим в рамках комитета высокого уровня и технической рабочей группы был предложен набор стандартов и руководящих указаний в отношении практики телемедицины в Индии [2]. Эти меры, среди прочего, имеют большое значение в предложении стандартов, которые очень важно учитывать при разработке индийской сети медицинской информации. В своей новаторской деятельности по определению

[7] Вклад: Балджит Сингх Беди, Советник по медицинской информатике, Центр разработки перспективных компьютерных систем (CDAC), организация при Министерстве связи и ИТ (MCIT), правительство Индии. См. Документ RGQ14.3.2-INF-0024.

ITIH основным заинтересованным сторонам в отрасли предоставлялись консультации для установления стандартов медицинской информации в стране с основной целью определить надлежащие электронные истории болезни (EHR). Предложенная структура была направлена на то, чтобы охватывать клинические стандарты, элементы данных, медицинские условные обозначения, минимальный набор данных, нормативно-правовую базу и стандарты передачи сообщений.

Далее эта инициатива перешла к министерству, которое ее применяло. Объединенным министерством здравоохранения и охраны семьи была создана подгруппа по стандартам телемедицины, действующая под эгидой целевой группы по телемедицине в Индии. В состав подгруппы вошли различные члены из разных правительственных и частных агентств/учреждений, которые взяли на себя инициативу по разработке общеприемлемых стандартов и руководящих указаний в области телемедицины. Подгруппа представила этот документ по надлежащим стандартам и руководящим указаниям по практике телемедицины в Индии и предложила для внедрения дальнейшие меры. Эта работа привлекла значительные вклады из действовавшей ранее инициативы DIT. Ряд национальных инициатив по стандартизации предоставляемых с помощью ИТ медицинских услуг, включая электронное здравоохранение, получили значительную пользу от этой новаторской работы. К числу таких инициатив относятся инициатива Национальной комиссии по знаниям – национального высшего директивного органа – по созданию рабочей группы для предложения разработки индийской сети медицинской информации (I-HIND). Подгруппа целевой группы Министерства здравоохранения и охраны семьи также получила существенную пользу от мер, о которых сообщалось и которые были приняты в связи с этим в области EMR. С расширением внедрения информационных технологий в различных секторах здравоохранения ожидается, что адаптация этих инициатив в области стандартизации будет иметь большое значение для повышения эффективности оказания комплексных медицинских услуг в Индии. Извлеченные в ходе этого процесса уроки будут полезными другим развивающимся странам в аналогичной деятельности.

2.2.2 Ввод в действие национального процесса стандартизации

Разные страны мира ощущают на себе воздействие внедрения информационно-коммуникационных технологий (ИКТ) в различных секторах экономики и общественных секторах. Несмотря на медленный старт, развивающиеся страны приступили к реализации полученных ими преимуществ, в том что касается стоимости, качества и доступности медицинских услуг. Это явилось подходящим временем для таких стран не только для того, чтобы содействовать внедрению этих услуг, но и для того, чтобы учиться на основе опыта развитых стран, сделав огромный скачок к началу процесса стандартизации в данном секторе, сопровождаемому множеством преимуществ. Для некоторых стран, таких как Индия, где услуги телемедицины уже развились до масштабов множества разрозненных сетей, находящихся в рабочем режиме, существует неизбежная необходимость в разработке стандартов и руководящих указаний для содействия росту практики телемедицины, которая была бы единообразной и научной. Два правительственных учреждения со сферами деятельности в области ИТ и здравоохранения являются ключевыми агентствами, которые занимаются этой программой и ее продвижением. В Индии первая инициатива была предпринята Министерством связи и ИТ, а впоследствии эта инициатива перешла к основному пользователю – Министерству здравоохранения и защиты семьи. В связи с этим были предприняты некоторые важные шаги, которые могут быть равным образом применимы к другим развивающимся странам:

a) Образование Рабочей группы экспертов и ее круг ведения

Это первый этап, который предполагает тщательный отбор экспертов из соответствующих специализированных областей, и эти члены должны быть отобраны из заинтересованных профессиональных и промышленных ассоциаций, академических учреждений, из числа чиновников государственных департаментов, из организаций, занимающихся научно-исследовательскими и опытно-конструкторскими работами (НИОКР) в области медицинской информатики, крупных агентств-пользователей и лиц, принимающих решения в больничных администрациях, из числа известных специалистов по ИТ, поставщиков медицинских приложений/услуг, производителей исходного оборудования, врачей и т. д. Их следует привлекать

к обсуждению возможных проблем и сбору сведений о потребностях, на основе чего можно будет изучать технические стандарты на предмет их соответствия сценарию в стране.

Следует сохранить условие для привлечения, если и когда это потребуется, других экспертов, например представителей юридических профессий. Группе следует должным образом определить ключевые критерии и концепцию, прежде чем переходить к обсуждению порядка действий по выполнению своего круга ведения в рамках установленного набора критериев.

b) Определение стандартов – основные задачи

Важно, чтобы у учреждения, которое начинает заниматься этой деятельностью, было четкое представление о задачах по определению стандартов электронного здравоохранения и соответствующих стандартов HMIS. Эти задачи могут включать:

- расширение возможностей доступа к качественному медицинскому обслуживанию для всех;
- содействие расширению электронного здравоохранения и систем HMIS;
- определение и поддержку механизмов защиты личной жизни и конфиденциальности в отношении медицинских данных отдельных людей, а также другие вопросы безопасности и юридические вопросы;
- расширение международного сотрудничества по научным, юридическим и этическим аспектам использования электронного здравоохранения;
- обеспечение рамок для функциональной совместимости и возможности увеличения масштабов услуг, предоставляемых с помощью ИТ, в стране и за ее пределами;
- увеличение прибыльности для различных заинтересованных сторон, включая поставщиков, пользователей, население в целом и т. д.

c) Система определения руководящих указаний и стандартов

Отмеченное ниже в особой степени относится к практике телемедицины:

- Функциональная совместимость: обеспечение того, чтобы сети телемедицины могли взаимодействовать, используя совместно приложения различных участвующих систем в реальном времени, или чтобы беспрепятственно взаимодействовать могли несколько приложений.
- Совместимость: способность систем различных поставщиков и различных версий одной и той же системы к присоединению.
- Возможность увеличения масштабов: оборудование/системы, используемые для телемедицины, могут расширяться с добавлением дополнительных элементов и функций как модульных добавочных опций.
- Переносимость: возможность того, чтобы данные, генерируемые приложением, работающим в какой-либо одной системе, переносились на другие платформы при минимальных усилиях.

Руководящая система должна обеспечивать:

- включение всех заинтересованных сторон;
- представление рекомендаций, нейтральных по отношению к поставщикам.

d) Клинические протоколы и руководящие указания

Рабочей группе экспертов также необходимо проверять клинические протоколы и руководящие указания, которые требуются. Клинические протоколы в практике телемедицины включают предварительно запланированные процедуры, фактические консультационные процедуры и процедуры работы телемедицинского оборудования (такие, как спецификации по передаче электросвязи). В клинических технических стандартах по качеству изображений при передаче

изображений желательно указывать технические стандарты, необходимые специалистам, например дерматологам, для обеспечения высокого уровня четкости и цвета изображений, что требуется, чтобы поставить пациенту правильный диагноз.

e) Круг ведения

Чтобы рабочая группа экспертов могла приступить к обсуждениям, требуется тщательно определить ее круг ведения, чтобы оптимальным образом охватить поставленную задачу. Ниже приводится для иллюстрации круг ведения такой рабочей группы экспертов в области телемедицины/электронного здравоохранения:

1 Тщательное обсуждение имеющихся международных стандартов и рекомендация стандартов, применимых к потребностям страны.

2 Разработка различных аспектов функциональной совместимости различных сетей/оборудования, которые должны функционировать вместе.

3 Разработка требований к совместимости технологий и существующей госпитальной информационной системы, насколько это практически возможно, с необходимыми стандартами.

4 Разработка возможностей увеличения масштаба принятых технологий и их способности переходить к расширенным возможностям.

5 Предложение структуры для стандартного EMR.

6 Рассмотрение стандартной цифровой информации на предмет совместимости с различными технологиями связи, которые имеются в стране, такими как ЦСИС, КТСОП, VSAT, беспроводные технологии, IP и т. д.

7 Стандартизация требований к проведению видеоконференций по телемедицине и возможности их экономичного применения.

8 Четкая стандартизация требований к телемедицине в различных медицинских сферах, таких как радиология, кардиология, патология и т. д., по отношению к совместимости систем с системой телемедицины.

9 Стандартизация и разработка формата методики передачи медицинских карт пациентов, включая оцифрованные медицинские данные, аспекты кодирования и конфиденциальности.

10 Рекомендация стандартных инструментов медицинской диагностики, таких как ЭКГ, рентгеновское сканирование и т. д., включая требования к системе камер для проведения видеоконференций.

11 Представление рекомендаций по обязательному/факультативному периферийному оборудованию для системы телемедицины.

12 Предложение стандартов в области конфиденциальности и безопасности.

13 Предложение нормативно-правовой базы.

Необходимо, чтобы для рабочей группы были установлены временные рамки с ориентировочными сроками представления ее рекомендаций. Также может быть полезным вести веб-сайт по этой деятельности, чтобы привлекать комментарии для активизации обсуждений. Для достижения окончательного консенсуса всегда важно проводить семинары-практикумы, участвовать в которых приглашаются многие заинтересованные стороны в целях представления, обсуждения и доработки рекомендаций.

2.2.3 Обзор ключевых технических стандартов

- Руководство развитием экосистемы ИТ в области здравоохранения

В этом направлении прилагаются огромные усилия на национальном и международном уровнях для регулирования/руководства развитием экосистемы ИТ в области здравоохранения. Эти усилия являются результатом насущной потребности в стандартизации процессов, где представлена медицинская информация, которая передается от системы к системе. Для любой развивающейся страны, которая начинает предлагать стандарты для электронного здравоохранения и больничных информационных управляющих систем (HMIS), настоятельно требуется изучить существующий международный статус, действующие организации, которые работают в этой области, и нынешний уровень внедрения разработанных стандартов, а также уровень их принятия и использования различными странами. Многие такие организации по разработке стандартов (OPC) и специальные группы по интересам (SIG) активно занимаются процессами стандартизации для решения вопросов, связанных с обменом медицинскими данными, структурой данных, управлением доступом, стандартизацией клинических процессов и бизнес-процессов в здравоохранении, а также безопасностью и конфиденциальностью. Ряд соответствующих ключевых стандартов, которые развивающиеся страны должны изучать и рассматривать на предмет их принятия для электронного здравоохранения и систем HMIS, кратко описываются ниже с указанием названия организации, которая эти стандарты распространяет. Это относится в равной мере как к сельской, так и к городской среде.

- Стандарты взаимообмена/обмена EHR и данными
  - ИСО/ТС 18308 – Требования к архитектуре электронных историй болезни

Этот стандарт разработан Техническим комитетом (ТК) 215, который занимается разработкой стандартов в области медицинской информатики Международной организации по стандартизации (ИСО). В стандарте дается определение и указаны основные характеристики EHR с необходимыми спецификациями.

  - CEN/TK 251 EN 13606 (EHRcom)

CEN/TK 251 EN 13606 (EHRcom) – стандарт из пяти частей, разработанный Техническим комитетом (ТК) 251 Европейского комитета по стандартизации (CEN). В нем представлены спецификации по структуре, контенту, связи и политике безопасности для сообщения EHR в целях достижения семантический функциональной совместимости во время обмена информацией, содержащейся в EHR.

  - Цифровые изображения и передача информации в медицине (DICOM)

DICOM (Цифровые изображения и передача информации в медицине) – это отраслевой стандарт ACR и Национальной ассоциации производителей электротехнического оборудования (NEMA), который содействует обмену медицинскими изображениями в цифровой форме и их обработке. Устройства для получения изображений (например, компьютерная томография), архивы изображений, устройства для получения печатных копий и рабочие станции для диагностических изображений различных поставщиков могут быть подключены к общей информационной инфраструктуре и интегрированы с другими информационными системами (например, службой архивирования и передачи изображений (PACS), HIS/RIS). Действующая в настоящее время версия – DICOM PS 3.0-2009.

- Стандарты здравоохранения седьмого уровня (HL7)

HL7 – стандарт Американского национального института стандартизации (ANSI) для передачи сообщений в условиях клиник, предназначенный для взаимного обмена клиническими сообщениями среди разрозненных систем телемедицины. HL7 означает седьмой уровень в здравоохранении; термин "уровень 7" относится к самому высокому уровню модели взаимосвязи открытых систем (OSI) Международной организации по стандартизации (ИСО). Имеются различные версии – HL7 2.x, HL7v3 и HL7 CDA. HL7v2.x определяет спецификации по функциональной совместимости для отправки/получения данных о медицинских случаях и запросов в форме отправки сообщений. Действующая в настоящее время версия HL7v3 основана на объектно-ориентированном подходе и обеспечивает спецификации по классам и объектам. Архитектура

клинических документов (CDA) HL7 – это стандарт разметки документов, в котором указана структура и семантика "клинических документов" в целях обмена ими.

- Карта непрерывного медицинского обслуживания (CCR) – стандарт ASTM

Карта непрерывного медицинского обслуживания (CCR) – стандарт, разработанный совместно международной организацией "Американское общество по испытанию материалов" (ASTM), Массачусетским медицинским сообществом (MMS), Сообществом по управлению информацией и информационным системам в области здравоохранения (HIMSS) и Американской академией врачей общей практики (AAFP), для определения минимального набора данных (MDS), который необходимо подготовить для краткого описания лечения пациента при передаче пациента от одного поставщика медицинских услуг другому. Цель этого стандарта состоит в том, чтобы свести к минимуму ошибки, не допускать задержек в лечении, ссылаясь при этом на неадекватную медицинскую информацию, а также в совершенствовании общего медицинского обслуживания в стране.

- CEN/TK 251 EN 13940

Это европейский стандарт, разработанный Техническим комитетом (ТК) 251 Европейского комитета по стандартизации (CEN) , который называется "Система медицинской информатики в концепциях по обеспечению непрерывного медицинского обслуживания" (CONTsys). В этом стандарте излагаются концепции и процессы, которые используются в медицинской деятельности по предоставлению пациентам медицинского обслуживания.

- Клинические стандарты

Стандарты представления клинических данных, или кодовые наборы, представляют собой семантическое представление медицинской информации. В секторе здравоохранения используются многие клинические стандарты для кодирования информации, касающейся болезней, процедур, клинических наблюдений, лекарственных препаратов, процедур ухода, расходных материалов, хирургических операций и т. д. Кроме того, они очень важны для процесса стандартизации. Большинство стран приняли кодовые наборы в соответствии со своими потребностями и характером использования. Деятельность по стандартизации в области электронного здравоохранения, систем HMIS и др. для развивающихся стран требует тщательного анализа и принятия клинических стандартов. Это имеет решающее значение для функциональной совместимости в успешной общенациональной системе медицинской информации, результатом которой является повышение безопасности пациентов. Существуют следующие три основные категории клинических стандартов:

  – коды болезней;
  – коды процедур;
  – коды клинических наблюдений.

Ниже перечислены некоторые широко известные и широко используемые системы кодирования.

- Международная классификация болезней (МКБ)

Всемирная организация здравоохранения (ВОЗ) явилась инициатором разработки системы кодирования Международной классификации болезней (МКБ) для содействия сопоставимости на международном уровне при сборе, обработке, классификации и представлении статистических данных по смертности и заболеваемости. В настоящее время принята версия МКБ-10, которая используется многими странами.

- Международная классификация болезней – 10-я версия – Система кодирования процедуры (МКБ-10-СКП)

Кодирование процедуры – это трансляция медицинской терминологии процедуры в коды.

- Систематизированная номенклатура медико-клинических терминов (SNOMED-CT)

Систематизированная номенклатура медико-клинических терминов (SNOMED-CT) – это подготовленная Организацией по разработке международных стандартов медицинской терминологии (IHTSDO) всеобъемлющая клиническая терминология, в которую входят коды для описания диагноза, лечения, а также процедур, выполняемых в процессе медико-санитарного обслуживания.

- Современная процедурная терминология (CPT)

Современная процедурная терминология (CPT) разработана Американской медицинской ассоциацией (AMA).

- Унифицированная система медицинского языка (UMLS)

UMLS разработана и сопровождается Национальной медицинской библиотекой США. Система обеспечивает структуру отображения между существующими терминологиями кодирования. Это эффективная система для обеспечения функциональной совместимости в организациях, которые используют те же информационные модели, но в рамках таких информационных моделей используют разные наборы кодов.

- Стандарты видеоконференц-связи

Эти стандарты также составляют один из важных аспектов электронного здравоохранения/телемедицины. Положительным моментом является наличие широко принятых на международном уровне стандартов, как например приведенный ниже разработанный Международным союзом электросвязи (МСЭ) стандарт функциональной совместимости видеоконференц-связи для различных режимов установления соединения.

  – Стандарты МСЭ-Т H.32x.

- Организации по стандартизации

Важно отметить, что организации по стандартизации, такие как Европейский комитет по стандартизации (CEN), Американское общество по испытанию материалов (ASTM), Международная организация по стандартизации (ИСО), Всемирная организация здравоохранения (ВОЗ), Международный союз электросвязи (МСЭ), Американский национальный институт стандартов (ANSI), Сообщество по управлению информацией и информационным системам в области здравоохранения (HIMSS) и другие работают над разными аспектами стандартов в области электронного здравоохранения, HMIS и другими разделами медицинской информатики. В течение многих лет эти организации разработали большое число конкретных важных стандартов. Любой развивающейся стране, приступающей к введению стандартизации, принесет пользу анализ этих имеющихся стандартов в целях определения их приемлемости для принятия. Наряду с этим для получения общей картины по этим вопросам могут оказаться полезными выпущенные недавно отчеты, например отчет МСЭ по этой теме, указанный в перечне справочных документов под номером 3.

2.2.4 Стандарт для больничной информационной управляющей системы (HMIS)

Один из важных аспектов стандартизации в HMIS связан с электронными медицинскими картами (EMR) или электронными историями болезни (EHR), стандартами двустороннего обмена/обмена данными и клиническими стандартами. Связанные с этим вопросы и ряд соответствующих стандартов подробнее рассматриваются в пункте 3.2. Основное преимущество использования стандартов в области HMIS заключается в возможности взаимодействия приложений HMIS с другими приложениями и создания унифицированных медицинских карт пациента для разных HMIS. Процесс стандартизации применяется, как правило, равным образом к малым и крупным больничным учреждениям в контексте HMIS. Однако основная разница между двумя категориями больничных учреждений определяется в контексте функциональных возможностей больничного учреждения и масштаба. Кроме того, следует учитывать среду, в которой соблюдаются стандарты. Малые больничные учреждения могут иметь системы одного или двух типов, такие как система регистрации пациентов и лабораторная информационная система. В такое среде соблюдение

единого стандарта, например HL7, достаточно, в то время как в среде крупных больничных учреждений, в которой эксплуатируются различные системы, в том числе сервер архивации и передачи изображений (PACS), HMIS, система управления лабораториями, системы радиологических отделений, сценарий становится более сложным. В такой среде необходимо придерживаться нескольких стандартов и наряду с этим необходимо соблюдать такие стандарты, как профили IHE, определяющие профили функциональной совместимости разных стандартов и оптимизирующие поток процесса.

HMIS и услуги электронного здравоохранения

Интеграция услуг электронного здравоохранения в HMIS больничного учреждения повышает эффективность взаимодействия системы электронного здравоохранения со специализированным лечебным учреждением. С расширением интеграции электронного здравоохранения/ телемедицины некоторые специализированные лечебные учреждения делают такую интеграцию одним из обязательных функциональных параметров для поставщиков, устанавливающих HMIS. В одной из успешно функционирующих сетей телемедицины штата Керала, Индия, этот функциональный параметр принес пользу онкологическим больным, находящимся в отдаленных населенных пунктах. В дополнение к функции онлайнового назначения консультаций EMR пациента, включенная в базу данных HMIS DICOM, доступна обоим сайтам при наличии разрешения HMIS и обновляется по итогам консультаций.

Решение на базе облачных вычислений для HMIS

Облачные вычисления, это еще одно средство, которое развивающимся странам необходимо внимательно рассмотреть в целях принятия для HMIS в больничных учреждениях. Возможность более эффективной связи и взаимодействия является огромным преимуществом облачной модели. Это позволяет обеспечивать унифицированный охват данным решением всей страны. Это также существенно снижает стоимость владения. Оно привнесет в предоставляемые услуги стандарты функциональной совместимости. Общедоступное облако, обеспечивающее услуги HMIS в больничных учреждениях разных уровней, может принципиально изменить сценарий предоставления медико-санитарных услуг в развивающейся стране. Некоторые штаты Индии уже обратились к решениям на базе облачных вычислений для ряда больничных учреждений, находящихся под их юрисдикцией.

2.2.5 Аспекты, связанные с нормативно-правовой базой и механизмами соблюдения

Поскольку на услуги электронного здравоохранения распространяются различные вопросы правового и юрисдикционного характера, важно понять ряд правовых аспектов. Так как юрисдикционные процессы различаются в разных странах, правовые последствия использования услуг электронного здравоохранения очевидно будут разными в каждой конкретной стране.

В Индии отсутствует правовая база, в рамках которой возможно было бы управление ростом сектора электронного здравоохранения. Введение такой правовой базы – насущная потребность времени, поскольку эта база обеспечивает надлежащее согласование между заинтересованными сторонами для достижения национальных целей любой развивающейся страны, планирующей интегрировать решения электронного здравоохранения в свою систему здравоохранения.

Подгруппа по стандартам телемедицины, созданная под эгидой Целевой группы по телемедицине в Индии, перед представлением своего отчета детально рассмотрела некоторые из этих вопросов. Этот аспект в настоящее время рассматривается также Индийской ассоциацией медицинской информатики (IAMI) и Обществом телемедицины Индии (TSI), двумя основными профессиональными сообществами в этой области. Действующий индийский закон не обеспечивает адекватного решения этого вопроса. Ниже кратко представлены некоторые рекомендательные аспекты, над которыми работает Подгруппа и которые должны быть разрешены в этом отношении.

Политика хранения данных

Электронный формат медицинский данных должен сохраняться в течение определенного времени неизменным или же максимально приближенным к оформляемым в письменном виде медицинским документам. Необходимо предусмотреть соответствующие системы резервного копирования для извлечения утерянных данных в случае проникновения вирусов/пожаров и других происшествий.

Обеспечение врачебной тайны/конфиденциальности в отношении пациентов и стандарты безопасности

Врачебная тайна и конфиденциальность в отношении пациента должны обеспечиваться всегда. Эти стандарты связаны со всеми стандартами других типов и охватывают их. Для этих целей должны учитываться различные юридические права и привилегии пациента. Это включает такие вопросы, как аутентификация, управление доступом и безопасность передачи. Пользователь должен иметь возможность сохранения анонимности передаваемых данных. Эти анонимно передаваемые данные не должны быть настолько детальными, чтобы указывать на определенного пациента. Должны быть приняты надлежащие положения по обеспечению безопасности для защиты от намеренных и ненамеренных действий, которые могут нарушить врачебную тайну в отношении пациента. К стандартам, которые необходимо принять, относятся методы кодирования и декодирования информации в системе электронного здравоохранения различных уровней.

Согласие пациента

Пользователи телемедицины должны быть ознакомлены с вопросами обеспечения конфиденциальности, которые связаны с передачей и совместным использованием данных пациента. Предпочтительно получение предварительного информированного согласия пациента до осуществления любой передачи идентифицирующих пациента данных в системе телемедицины.

Качество обслуживания

Для обеспечения этого все структуры, участвующие в полной операции обмена, должны быть уверены в отсутствии ошибок в данных и бесперебойности и безусловности этой операции обмена.

Владение данными

Пациент и/или официальный опекун признается действительным единственным и законным владельцем медицинских данных. Сайт, консультант и специалист являются хранителями этой информации и, следовательно, принимают все меры предосторожности для защиты личной информации, информации идентификации и т. д.

Разрешение споров

Неопределенность также существует в отношении числа юридических вопросов, связанных с ответственностью и правами в контексте функционирования телемедицины. Необходимо четко определить условия разрешения споров.

2.2.6 Механизмы и задачи соответствия

Механизмы обеспечения соблюдения заинтересованными сторонами основополагающих стандартов составляют одну из сложнейших задач, которая стоит практически перед всеми странами, осуществляющими их внедрение. Соблюдение стандартов в услугах электронного здравоохранения следует рассматривать в двух аспектах: представление и передача медицинской информации. Представление информации включает структуру информации и тип контента, который может представить эта структура. Это также включает стандартизацию клинических терминов, используемых в медицинской информации. Передача включает соблюдение применимых стандартов в соответствии с характером системы. Например, в больничной информационной системе (HMIS) могут использоваться стандарты HL7 для передачи информации, а для

радиологических приложений и медицинских устройств может использоваться стандарт DICOM ассоциации NEMA. Процессу обеспечения соблюдения стандартов в современной отрасли ИТ для здравоохранения помогут руководящие указания в области регулирования. Однако этот процесс повлечет за собой новые проблемы, такие как существенное увеличение объема деятельности и стоимости продукта, соответствующего конкретным стандартам, а также уровень соблюдения стандартов.

Первый шаг, заключающийся в достижении консенсуса между заинтересованными сторонами относительно применимых стандартов, независимо от того, разработаны они национальными или международными организациями по стандартизации, сам является весьма длительным процессом. Охват стандартов с учетом интересов всех заинтересованных сторон в сочетании с нейтральностью поставщиков в отношении стандартов делает этот процесс сложным и длительным. Следующий за этим шагом процесс придания обязательного характера применимым и рекомендованным стандартом различен для разных стран в зависимости от типа системы управления.

Развивающиеся страны, начиная процесс внедрения в систему стандартизации, в целом могут воспользоваться двумя исходными преимуществами. Во-первых, они не обременены слишком большим числом унаследованных систем, которые необходимо учитывать. Другими словами, они имеют преимущества начинающего. Во-вторых, они могут изучить и извлечь уроки из опыта развитых стран и нескольких развивающихся стран, которые достигли значительных результатов в выполнении этого процесса. Аналогично эти страны столкнутся с двоякой проблемой наличия квалифицированных людских ресурсов и необходимостью оптимизации финансовой нагрузки в краткосрочной перспективе и ожиданиями в отношении прибыли на инвестиции в долгосрочной перспективе.

Необходимо отметить, что для выполнения самых первых шагов, связанных с повышением осведомленности и актуализацией деятельности, требуется руководство. Именно под руководством разные группы заинтересованных сторон будут организованы для достижения этой общей цели. Руководство должно понять эксплуатационные механизмы в стране и продолжать соответствующим образом работу с директивными органами. Первый шаг по созданию национального экспертного комитета/рабочей группы требует разрешения/согласия компетентного органа власти, с тем чтобы рекомендации этой структуры имели вес. Ниже кратко представлены некоторые уроки, извлеченные из индийского сценария развития событий.

Извлеченные уроки и рекомендации для других развивающихся стран

Феноменальный рост сектора ИТ и программного обеспечения, наблюдаемый в течение последних двух десятилетий, вызвал огромный интерес к услугам на базе ИТ в Индии. Начался рост этих приложений и они уже внедряются в секторе здравоохранения. Большая доля сельского населения и недостаточные клинические людские ресурсы в сочетании с их территориальным распределением привлекли внимание к потенциалу телемедицины при большом числе сетей телемедицины, в основном поддерживаемых техническими министерствами Департамента космических исследований, которые обеспечивают возможность спутникового подключения, и Министерства связи и ИТ (MCIT). В течение этого этапа, примерно в 2002 году, MCIT учредило Техническую рабочую группу, с тем чтобы она рекомендовала стандарты для телемедицины и одновременно проводила исследования в целях предложения структуры основанной на стандартах инфраструктуры ИТ для здравоохранения. Обе рекомендации были представлены к маю 2003 года после их всестороннего анализа на семинарах-практикумах большим числом заинтересованных сторон из государственного и частного секторов, включая государственные учреждения и академические организации в области ИТ и медицины.

Были обсуждены вопросы, касающиеся придания этим рекомендациям обязательного характера. Во-первых, было признано, что любую законодательную деятельность должен инициировать основной пользователь – Министерство здравоохранения в соответствии с деловыми правилами, так как тематика в основном относится к его сфере, а не Министерство ИТ, которое стало автором этой инициативы. Это оказалось трудоемкой деятельностью. В рамках альтернативного подхода эти рекомендации были гласно размещены на веб-сайте Министерства связи и ИТ в сентябре

2003 года. Поскольку эти рекомендации были тщательно проанализированы после должного и всестороннего рассмотрения и при консультации с ведущими экспертами и большинством основных заинтересованных сторон, документы стали руководящими указаниями по моделированию для отрасли и заинтересованных сторон. Ряд государственных департаментов включили эти руководящие указания в свои основные требования, выражая заинтересованность в компьютеризации медицинских учреждений. Эта методика обеспечила высокий уровень внимания, осведомленности и деятельности по соответствию на самых ранних этапах расширения внедрения электронного здравоохранения в Индии и может служить примером для других развивающихся стран. Необходимо отметить, однако, что для придания рекомендациям обязательного характера для всего государственного и частного сектора, должен быть внесен законодательный акт в соответствии с требуемой процедурой, принятой в соответствующей стране.

Для того чтобы побудить заинтересованные стороны принять рекомендованные стандарты, могут быть рассмотрены некоторые содействующие шаги при поддержке заинтересованного министерства/департамента в стране. Например, Министерство связи и ИТ Индии поддерживало одно из своих научных обществ в разработке пакетов программного обеспечения для DICOM и HL7. DICOM – это один из основных стандартов обработки и передачи изображений и документов в медицинской области, принятый Ассоциацией радиологов. HL7 – это один из основных стандартов обмена сообщениями, передачи информации и управления информацией в медицинской области. Этот стандарт широко используется в медицинских системах обмена информацией и сообщениями. В настоящее время в отрасли существует весьма незначительное число приложений, поддерживающих вышеуказанные стандарты, в силу их сложности и трудоемкости их реализации. Однако в ближайшее время ожидается спрос на такие технологии. Библиотеки классов DICOM и HL7 обеспечат простоту интеграции DICOM и HL7 в любое приложение и соответствие этим стандартам. Эти библиотеки могут также использоваться производителями медицинских устройств, для того чтобы сделать свои устройства соответствующими стандартам DICOM и HL7.

Среди поставщиков бытует ошибочное представление о том, что соблюдение стандартов может уменьшить их долю рынка, поскольку соблюдение стандартов сократит проприетарные функции. Это заблуждение следует разъяснить путем повышения уровня осведомленности о важности соблюдения стандартов и открываемых благодаря этому потенциальных будущих возможностей.

Наряду с этим регуляторные органы, направляющие преобразование ИТ в здравоохранении, для достижения соответствия могут использовать определенные механизмы в соответствии с руководящими указаниями. Следует составить документ, содержащий руководящие указания в области регулирования, с тем чтобы описать применение стандартов в соответствии с характером услуг электронного здравоохранения. Одним из эффективных механизмов является заинтересованность поставщиков в области здравоохранения в соблюдении стандартов. С тем чтобы обеспечить такую заинтересованность, необходимо выполнить оценку соблюдения стандартов. Это можно осуществить путем создания национальной инфраструктуры сертификации услуг электронного здравоохранения, с помощью которой поставщики в области здравоохранения могли бы проходить сертификацию на соответствие. Такой механизм может помочь регуляторным органам повысить будущий спрос на сертифицированные услуги электронного здравоохранения.

Справочные материалы

[1] Health Unite: Recommended Framework for Information Technology Infrastructure for Health in India, DIT, Ministry of Communication and IT.

[2] Report of the Technical Working Group on Telemedicine Standardization: Recommended Guidelines & Standards for Practice of Telemedicine in India, September, 2003; DIT, Ministry of Communication and IT.

[3] Standards and eHealth: ITU Technology Watch Report, January 2011.

2.3 Экономика применения электронного здравоохранения

[8] Одной из стратегических перспектив электронного здравоохранения является повышение эффективности здравоохранения, то есть круглосуточное и ежедневное предоставление высококачественной медицинской помощи всем гражданам, независимо от их местонахождения и без промедления, с тем чтобы сократить затраты на медицинское обслуживание. (Общие затраты на здравоохранение являются суммой государственных и частных расходов на медицинское обслуживание.) Общие затраты на здравоохранение во всех странах, как процент валового внутреннего продукта (ВВП), в течение последних десятилетий постепенно и неуклонно растут и вскоре достигнут уровня, когда бремя расходов окажется более неприемлемым [1]. Очевидно, что развивающиеся страны не имеют возможности обеспечить те же темпы роста объема средств, выделяемых на здравоохранение. Развивающиеся страны вынуждены искать иные пути и инвестировать меньшие средства, для того чтобы обеспечивать услуги здравоохранения, уровень которых был бы аналогичен уровню услуг, предоставляемых гражданам в развивающихся странах. Наилучшим возможным решением является электронное здравоохранение, если оно может гарантировать уменьшение расходов на здравоохранение и, кроме того, обеспечивать определенное высокое качество медицинского обслуживания.

Обсуждение вопроса о том, являются ли приложения электронного здравоохранения рентабельными, имеет существенное значение, поскольку развитие и расширение приложений электронного здравоохранения составляют часть стратегии многих национальных правительств, а также политики в области здравоохранения международных организаций и органов, таких как ВОЗ, МСЭ, Европейский союз (ЕС). Вследствие этого проблема рентабельности электронного здравоохранения является жизненно важной и для нашей страны.

Ниже кратко представлены последние достижения в области экономики электронного здравоохранения и ответы на вопросы "Рентабельно ли здравоохранение?" и "Как оценить потенциальные финансовые последствия применения электронного здравоохранения до его внедрения?".

2.3.1 Экономика электронного здравоохранения

Роль экономики электронного здравоохранения заключается в оценке затрат и выгод программы внедрения электронного здравоохранения в динамике и для нескольких заинтересованных сторон, включая граждан, пациентов, операторов, работников здравоохранения и других медицинских работников, организации, предоставляющие услуги в области здравоохранения, и плательщиков.

Начальные исследования рентабельности [2], а также ряд недавних публикаций [3] однозначно указывают, что отсутствуют достоверные свидетельства того, что электронное здравоохранение является рентабельным способом предоставления услуг здравоохранения. Ряд авторов даже подчеркивают, что затраты выше в случае удаленных консультаций по сравнению с традиционным приемом в поликлинике, хотя они и поддерживают гипотезу о том, что потери эффективности в этом случае ниже [4].

Данные самых последних исследований экономики электронного здравоохранения, полученные на основе крупномасштабных исследований (то есть либо на базе большого числа консультаций или продолжительного опыта) свидетельствуют об обратном, например:

- В проведенном в Японии исследовании, материалы которого опубликованы в 2013 году, изучались долговременные последствия использования электронного здравоохранения для постоянных жителей поселка Нисиайдзу в префектуре Фукусима, Япония, в период между 2002 и 2010 годами. Авторы сравнивали медицинские расходы и дни лечения пациентов,

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пользовавшихся и не пользовавшихся системой медицинской помощи на расстоянии, имеющих хронические заболевания (инсульт, гипертензия, сердечная недостаточность и диабет разных типов). Применяя строгие статистические методы, в том числе системный обобщенный метод моментов, было выявлено, что в случае пользователей системы медицинской помощи на расстоянии потребовалось меньшее число дней лечения и меньшие медицинские расходы по сравнению с пациентами, не пользовавшимися этой системой [5].

- Другое подробное обследование представило результаты проводимых в течение пяти лет телеконсультаций педиатра. Авторы подчеркивали, что общая стоимость проведения 1499 консультаций составила 955 996 австралийских долларов. Оценочная возможная стоимость предоставления амбулаторных услуг тому же числу пациентов в Королевской детской больнице в Брисбене составила 1 553 264 австралийских долларов, таким образом, телеконсультации педиатра обеспечили поставщику медицинского обслуживания чистую экономию в размере примерно 600 000 австралийских долларов [6].
- Самым убедительным доказательством эффективности электронного здравоохранения являются клинические результаты мониторинга на дому пациентов с хроническими заболеваниями, гипертензией, диабетом разных типов и СПИДом. Это также убедительное свидетельство того, что электронное здравоохранение обеспечивает экономию затрат при том же качестве, что и качество очного обслуживания в рамках неотложной медицинской помощи, и является выгодным в хирургических и неонатальных отделениях интенсивной терапии, а также при переводе пациентов в нейрохирургию [7].

В чем причина такого расхождения мнений о рентабельности электронного здравоохранения? Причины следующие:

- Ограниченные данные или анализ на основе журнальных статей, опубликованных в основном в журналах "Телемедицина и электронное здравоохранение" и "Телемедицина и медицинская помощь на расстоянии". В этих двух журналах печатаются преимущественно статьи англоязычного сообщества.
- Выборки малого размера – большинство исследований базируются на выборках, не превышающих 100 участников.
- В очень небольшом числе работ измеренные результаты напрямую увязываются с решениями электронного здравоохранения.
- Только в 26% исследований указан период времени, хотя он является важнейшим параметром при определении рентабельности в долгосрочной перспективе.
- Слабые инструменты оценки и отсутствие широко принятой методики.
- Длительный период до точки безубыточности.
- Неизменные технологии и изменения затрат.

При рассмотрении результатов длительных исследований в "менее развитых" странах, таких как Бразилия и Россия, данные получаются довольно интересными и убедительными.

2.3.2 Что, где, сколько стоит

Согласно оценкам врачей из Западной Сибири, основанных на почти десятилетнем опыте обеспечения электронного здравоохранения, пациенты платили за виртуальные консультации высококвалифицированного московского специалиста примерно в 40 раз меньше, чем они заплатили бы в случае поездки в Москву на консультацию к тому же специалисту. Качество обслуживания – равного уровня [8]. Те же авторы [10] провели детальный анализ прибыли на инвестиции в электронных клиниках и показали, что прибыль на инвестиции начинает формироваться после начального периода в 2,5 года. Несмотря на то что большинство их публикаций печатаются в России, интересно следить за теми, которые публикуются на других

языках или переводятся, поскольку прибыль на инвестиции является лишь одним из 20 показателей, используемых в их экономическом анализе проектов в области телемедицины.

Другим примером является телекардиологическая служба в бразильском штате Минас-Жерайс. Территория штата Минас-Жерайс равняется территории Франции, а численность населения, проживающего в 853 городах, составляет 19 000 000 человек. Служба телекардиологии функционирует с июня 2006 года в 82 удаленных и малодоступных деревнях. Предварительные результаты оценки экономической целесообразности показали, что экономия, обеспечиваемая сокращением на 1,5% числа медицинских процедур, выполняемых за пределами деревни, достаточна для покрытия текущих затрат системы [10].

Правильно выбранные приложения электронного здравоохранения выгодны повсеместно. Согласно исследованию, проведенному в относительно "меньшей" стране – Италии – в 2001 году, в регионе Пармы была организована круглосуточная ежедневная бесплатная телефонная горячая линия для детей и взрослых с диабетом 1-го типа [11]. Обширное исследование, начавшееся в 2001 году и завершившееся в конце 2006 года, показало, что помощь за это время получил 421 ребенок (средний возраст – 10,8 лет, средняя продолжительность диабета – 4,5 года). В течение этого пятилетнего периода было зарегистрировано 20 075 обращений или в среднем 11 обращений в день. Из них 52% составили обращения неотложного характера. Благодаря этой доступной службе случаи госпитализации в связи с диабетическим кетоацидозом сократились в среднем с 10 случаев на 100 детей в год до 3 случаев на 100 детей в год. Или расходы в связи с госпитализацией сократились на 60% [11].

С 1994 года услуги электронного здравоохранения предоставляются в поселке Нисиайдзу, Япония. Основные физиологические параметры передаются в удаленное медицинское учреждение, ведущее мониторинг пациентов, у которых диагностировано высокое кровяное давление, церебральный инфаркт, инсульт, диабет разных типов, а также пациентов пожилого возраста. В нескольких работах [12–13] анализируется рентабельность этой системы. В работах показано, что медицинские расходы пользователей электронного здравоохранения, связанные с заболеваниями, которые обусловливаются образом жизни, сократились на 20,7%. Авторы также показывают, что пациенты, которые пользуются услугами электронного здравоохранения на протяжении длительного периода времени, несут меньшие медицинские расходы по сравнению с теми пациентами, которые пользуются этими услугами в течение менее длительного периода, и этот результат еще раз подтверждает тот факт, что при анализе рентабельности необходимо опираться на крупномасштабные и длительные исследования.

Наши результаты также подтверждают, что приложения электронного здравоохранения могут быть рентабельными. Однако всегда необходимо задавать вопрос: рентабельны для кого? Обнадеживающими являются результаты внедрения психологических телеконсультаций в Болгарии. По результатам 6000 часов виртуальных консультаций в течение пяти лет очевидно, что клиенты экономят деньги [14]. Виртуальные консультации в три-четыре раза дешевле по сравнению с очными визитами.

2.3.3 Как оценить экономическую эффективность

Необходимо подчеркнуть, что не существует широко принятой и признанной методики оценки экономического эффекта реализации электронного здравоохранения. Одним из простейших способов является расчет прибыли на инвестиции (ROI).

ROI – это показатель деятельности, используемый для оценки эффективности инвестиций или для сравнения эффективности ряда разных инвестиций. Для расчета ROI доход (прибыль) от инвестиций делится на стоимость инвестиций, а результат выражается в процентах или в форме отношения.

Другим и, возможно, более удачным методом оценки экономический эффективности, особенно в наиболее масштабном случае, например внедрение дистанционных консультаций и поддержки, является учет следующих факторов:

- число направлений пациентов и соответствующее расстояние, личные и транспортные расходы, связанные с используемым для транспортировки транспортным средством амортизация, налоги и страхование, а также затраты на связь;
- расходы на дополнительный административный, технический и клинический персонал и расходы на связь;
- учитывая наряду с этим все затраты на эксплуатацию системы, а также амортизацию и капитальные затраты и разделив полученную сумму на число выполненных операций, можно рассчитать стоимость единичной операции.

Кроме того, можно рассчитать эффективность операций электронного здравоохранения, определенную как процент непотребовавшихся направлений пациентов благодаря использованию системы электронного здравоохранения относительно общего числа направлений пациентов.

Сравнивания затраты и прибыль возможно установить минимальное число операций системы электронного здравоохранения (точка равновесия), при которых система становится экономически обоснованной, и оценить экономию [15].

Еще один относительно простой метод оценки экономического эффекта предложила недавно Бразилия [16]. Метод выведен на основе огромного числа обращений к системе электронного здравоохранения – более 33 000 телеконсультаций и 850 000 дистанционных анализов ЭКГ, проведенных в 86 муниципальных образованиях в течение пяти лет. Авторы рассматривали три параметра – переменную стоимость единичного направления пациента (RVC) и расстояние направления (D):

$$RVC = a.D \quad (1),$$

где "a" представляет стоимость транспортировки на километр.

Необходимо отметить, что в анализе используется только переменная стоимость. Причина этого проста – приложения электронного здравоохранения не сокращают на 100% число направлений и, следовательно, фиксированные затраты, такие как личные затраты и амортизация, сохраняются, а экономия базируется только на переменной стоимости.

Экономия (S), обеспечиваемая приложениями электронного здравоохранения, должна рассчитываться следующим образом:

$$S = \eta.\ RVC = \eta.\ a.D \quad (2),$$

где η – эффективность операции системы электронного здравоохранения или это процент непотребовавшихся направлений пациентов благодаря использованию системы электронного здравоохранения относительно общего числа направлений пациентов. Следовательно, для того чтобы единичная операция электронного здравоохранения (UAC) была экономически эффективной, ее стоимость должна быть по крайней мере равной экономии (S), или

$$UAC = \eta.\ a.D \quad (3).$$

На основе простого уравнения определяем, что минимальное расстояние для обеспечения рентабельности должно составлять:

$$Dmin = UAC/\eta.a \quad (4).$$

Если расстояние до конкретного города/медицинского учреждения/муниципального образования, куда направлен пациент, рассчитанное как взвешенное среднее число и расстояние направлений, больше Dmin, то реализация системы обеспечит экономию для этого конкретного города/медицинского учреждения/муниципального образования. На основе своего опыта авторы [16] рассчитали, что минимальное расстояние для обеспечения экономической эффективности составляет 20 км, то есть внедрение приложений электронного здравоохранения, которые сократят число направлений пациентов в пункт, находящийся на расстоянии более 20 км, является экономически обоснованным. Кроме того, было отмечено, что при повышении

эффективности деятельности или снижении стоимости единичной операции система становится экономически обоснованной даже при меньших рекомендованных расстояниях.

2.3.4 Заключение

Развивающиеся страны сталкиваются с серьезными проблемами при адаптации системы медицинского обслуживания и обеспечении удовлетворительных медико-санитарных услуг для всех в круглосуточном ежедневном режиме. Обязательным становится электронное здравоохранение. Учитывая, что большая часть затрат на направление пациента связана с его транспортировкой, знание: a) расстояния до центров, в которые направляются пациенты; и b) среднего числа направляемых пациентов из одного города может позволить сделать предварительный расчет экономических аспектов внедрения конкретных приложений электронного здравоохранения в каждом данном случае.

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2.4 ИКТ для улучшения информационного обеспечения и отчетности о состоянии здоровья женщин и детей

[9]В силу финансовых, политических и культурных причин медицинское обслуживание детей и женщин зачастую не обеспечивается. Широкий спектр приложений на базе ИКТ является превосходным инструментом улучшения медицинского обслуживания детей и женщин.

CoIA было подчеркнуто значение использования электронного здравоохранения и инновационных инструментов, а также услуг на базе интернета для улучшения медико-санитарного обслуживания матери и ребенка. За последние годы выросли темпы внедрения ИКТ в секторе здравоохранения, что частично обусловливается важнейшей ролю, которые эти технологии играют в упрощении доступа к эффективным процессам планирования семьи и сбора данных в целях совершенствования отчетности по показателям CoIA.

Высокий уровень проникновения и масштабы использования радио и телевидения в странах CoIA, даже в сообществах с малым доходом и расположенных в труднодоступных областях, делают их отличным инструментом для распространения предупреждающей информации о здоровье матери и ребенка и пропагандистских материалов. Наряду с этим расширение доступа к другим ИКТ, включая подвижную сотовую телефонную связь, услуги интернета, подвижную и фиксированную широкополосную связь, веб-инструменты и системы на базе облачных вычислений дало странам CoIA возможность создания национальных систем медицинской информации (HIS). В целях содействия расширению программ мобильного здравоохранения в рамках охраны материнства и детства (MNCH) и в поддержку глобальной стратегии Генерального секретаря Организации Объединенных Наций "Каждая женщина, каждый ребенок" Рабочая группа по новаторским решениям, управляемая Альянсом мобильного здравоохранения, инициировала создание каталитического механизма финансирования при финансовой помощи Норвежского агентства по сотрудничеству в целях развития (Norad) и при технической поддержке ВОЗ.

В настоящее время гранты для развития мобильного здравоохранения предоставлены 16 проектам или получателям помощи, которые представлены в Таблице 1 (Выполняемые проекты – получатели грантов Рабочей группы по новаторским решениям (2012–2014 гг.)), ниже, и действуют в 12 странах Африки и Азии. Совокупно эти проекты должны охватить 1,5 млн. матерей и детей, 6500 медицинских учреждений и 100 000 медицинских работников. В дополнение к этому в рамках каждого двухгодичного периода действия грантов Альянс мобильного здравоохранения и ВОЗ предоставляют возможности совместного обучения и целевой технической помощи в проблемных областях в процессе развертывания проектов, включая формирование свидетельств, приемлемых для разных заинтересованных сторон, разработку устойчивых бизнес-моделей, создание партнерств государственного и частного секторов и достижение воздействия на здоровье.

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Таблица 1: Выполняемые проекты – получатели грантов Рабочей группы по новаторским решениям (2012–2014 гг.)

Этап 1 (январь 2012 г. – декабрь 2013 г.): получатели грантов	
Cell-Life – MAMA, Южная Африка	В рамках проекта Cell-Life используется услуга MAMA SMS для предоставления матерям информации о проверке на ВИЧ, здоровой беременности и уходе за детьми младенческого возраста, а также предоставления матерям доступа к национальной горячей линии по вопросам СПИДа. Cell-Life поддерживает партнерские отношения с местными отделами здравоохранения и НГО, с тем чтобы обеспечить охват *38 000 матерей к 2014 году*.
Инициатива Клинтона по обеспечению доступа к медицинским услугам (CHAI) – SMART, Нигерия	Осуществляя проект CHAI, Федеральное министерство здравоохранения (FMOH) Нигерии и компания Hewlett Packard установили партнерские отношения в целях обеспечения устройствами печати SMS для ускорения получения результатов анализов в рамках программы диагностирования у новорожденных ВИЧ/СПИДа (SMART), что сокращает время между сдачей анализов и получением их результатов примерно на 15 дней. К 2014 году по проекту CHAI планируется *ввести в использование 600 печатающих устройств во всех 6 географических зонах*.
Dimagi – CommCare, Индия	В партнерстве с Католической службой помощи, организацией World Vision и Фондом "Настоящая медицина", аккредитованными социальными работниками сферы здравоохранения был развернут мобильный инструмент с открытым исходным кодом компании Dimagi для медицинского обслуживания матерей и детей, цель которого заключается в предоставлении медицинской информации и услуг в пяти провинциях Индии. Для обеспечения наращивания масштабов компания Dimagi внедрила инструмент управления активными данными, который служит для стратегического использования данных, собранных для целей принятия решений.
D-Tree International – mNUT, Занзибар	Совместно с ЮНИСЕФ и правительством Занзибара D-Tree International предоставляет сельским медицинским работникам функционирующее на базе мобильных телефонов приложение поддержки принятия решений, которое служит им в качестве инструмента для выявления и осуществления лечения и ухода за детьми с тяжелыми формами острой недостаточности питания. К 2014 году D-Tree рассчитывает развернуть системы во всех 10 округах Занзибара.
Фонд "Грамин" – MOTECH, Гана	Фонд "Грамин" в партнерстве со службой здравоохранения Ганы осуществляет поддержку малоимущих сельских женщин и медицинских сестер в сообществах, предоставляя женщинам своевременную информацию по вопросам беременности, уходу за детьми и приема у врача, при этом обеспечивая системы электронных медицинских карт для сестер. Фонд "Грамин" организовал партнерство государственного и частного секторов с MTN Ганы в целях устойчивого расширения доступа к этим услугам.
IRD – Интерактивные предупреждения для расширения охвата прививками, Пакистан	Организация Interactive Research and Development (IRD) использует интерактивные предупреждения, электронный регистр вакцин для наращивания уровня применения вакцин в рамках поддержки расширенной программы иммунизации, проводимой в Пакистане. Интерактивные предупреждения – это напоминания с помощью SMS пациентам и лицам, осуществляющим уход, наклеиваемые метки радиочастотной идентификации для карточек иммунизации и инновационная лотерейная система условного перевода наличных средств для охвата 15 000 детей младенческого возраста в провинции Синд.
RapidSMS и mUbuzima, Министерство здравоохранения Руанды	Министерство здравоохранения Руанды осуществляет профессиональную подготовку медицинских работников сообществ по использованию приложений электронного здравоохранения в целях контроля и содействия охране здоровья матери и ребенка, выявления потенциальных рисков и содействия пренатальному уходу в медицинских пунктах. Используются приложения "RapidSMS", которые помогают осуществлять ведение беременных женщин, и "mUbuzima", которые служат для сбора данных и подготовки отчетов по показателям ЦРТ на уровне сообществ.
Novartis – SMS для жизни, Камерун, Танзания, Гана	Разработанная компанией Novartis инициатива "SMS для жизни", с помощью которой отслеживаются уровни недельных запасов основных противомалярийных препаратов для сокращения числа случаев их отсутствия, в настоящее время разворачивается для охвата всех медицинских учреждений в Камеруне и Танзании. В Гане "SMS для жизни" используется для снижения смертности в детском возрасте путем обеспечения наглядной индикации в режиме реального времени запасов крови во всех больницах Ганы.

Этап 2 (январь 2013 г. – декабрь 2014 г.): получатели грантов	
Changamka Microhealth – Развитие с помощью мобильных средств, Кения	Деятельность организации Changamka Microhealth направлена на сокращение финансовых, транспортных и информационных барьеров для доступа к охране здоровья матери и ребенка путем обеспечения женщин мобильным доступом к их средствам и медицинскому страхованию, информационными сообщениями и напоминаниями о приеме у врача. Обслуживающая в настоящее время сельское население округа Вихига Changamka планирует развернуть свою деятельность *еще в трех западных округах Кении* к *2015 году*.
CHAI – Поддержка матери-ребенка с использованием технологии отправки SMS с помощью средств подвижной связи, Малави	CHAI использует программное обеспечение Frontline SMS в целях расширения пропускной способности для последующего наблюдения за пациентами в рамках своей модели ухода за пациентами, а также лечебное учреждение матери и ребенка (MIP) для предотвращения передачи ВИЧ от матери к ребенку. К 2015 году Frontline SMS будут обеспечены медицинские работники в лечебных учреждениях MIP *в шести округах южного района Малави*.
Международный институт по вопросам связи и развития (IICD) – MAMMA, Мали и Сенегал	В целях контроля малярии IICD и его партнеры осуществляют обучение медицинских работников на уровне сообществ использованию мобильных приложений для оптимизации сбора местных данных, логистической координации и связи с лечебными учреждениями. Приложения также позволяют лечебным учреждениям и организациям сообществ более оперативно реагировать на вспышки малярии. К 2015 году IICD планирует осуществлять мониторинг *200 000 человек населения в Бамако, Мали, и 100 000 человек населения в области Фатик Сенегала*.
Остановить малярию – NightWatch, Танзания	Программа "Остановить малярию" будет сотрудничать с Танзанийским центром кадрового резерва для разработки программы NightWatch: Mobile. Эта программа привнесет интерактивный мобильный компонент в платформу связи по вопросам малярии NightWatch в целях расширения знаний и стимулирования использования надкроватных сеток для профилактики малярии в Танзании.
Фонд Praekelt – MAMA, Южная Африка	Фонд Praekelt использует услугу MAMA SMS в Южной Африке для обеспечения матерей высококачественной и актуальной для конкретной местности еженедельной информацией по вопросам беременности и ухода за детьми младенческого возраста. Эта услуга будет расширяться, с тем чтобы включить портал сообщества с функциями социальных сетей, что позволит осуществлять общение в реальном времени с экспертами и советниками, а также отправку SMS и интерактивные опросы. В рамках MAMA *планируется в течение трех охватить этими услугами один миллион матерей и глав домашних хозяйств*.
Medic Mobile – Kujua ("Знать"), Индия	Компания Medic Mobile установила партнерские отношения с центрами Фонда развития медицины в Индии для обеспечения возможности расширения и охвата его новой программной платформы PatientView, которая обеспечивает отправку пациентам напоминающих о вакцинации SMS для дальнейшего увеличения темпов вакцинации необслуживаемого населения. Medic Mobile *планирует охватить к 2015 году 50 000 пациентов в Дели, Варангале, Мумбае и Хайдарабаде*.
Общество за ликвидацию нищеты в сельских районах (SERP) –mNDCC, Индия	Общество за ликвидацию нищеты в сельских районах (SERP) использует mNDCC (мобильные пункты по уходу за детьми) для расширения услуг в области здравоохранения и питания, которые медицинские работники сообществ предоставляют матерям и детям в сельском штате Индии Андхра-Прадеш. *К 2015 году охват mNDCC, который в настоящее время составляет 4 200 деревень NDCC, будет расширен до всех 38 000 деревень штата Андхра-Прадеш*.
VillageReach – Chipatala cha pa Foni ("Медицинский центр по телефону"), Малави	VillageReach – это экспериментальная бесплатная горячая линия "Chipatala cha pa Foni" (CCPF), предназначенная для улучшения процесса ведения пациентов – матерей и детей и расширения использования услуг на базе сообществ и медицинских пунктов в сельских районах. *К 2015 году CCPF будет доступна для примерно 400 000 женщин и детей в трех округах юго-восточной области Малави*.

Источник: *Альянс мобильного здравоохранения*

Кроме того, внедрение средств телемедицины, услуг мобильного здравоохранения, экстренных бесплатных горячих линий и других каналов связи в почти реальном времени в разных странах CoIA расширило результаты работы традиционных систем предоставления медицинских услуг. В отдаленных затронутых конфликтами зонах и в труднодоступных областях телемедицина открывает каналы связи между местными практикующими медицинскими работниками и диагностами, что обеспечивает существенную экономию средств и расширение возможностей местного персонала. Осуществление инициатив в области электронного здравоохранения и ИКТ приносит пользу заинтересованным сторонам не только в рамках континуума помощи ВОЗ, но и в рамках всего сектора здравоохранения, как это показано на Рисунке 2 и пояснено в Таблице 2 (Электронное здравоохранение и инновации в области ИКТ на протяжении всего континуума помощи ВОЗ), ниже.

Рисунок 2: Приложения электронного здравоохранения и ИКТ приносят пользу разным заинтересованным сторонам в секторе здравоохранения

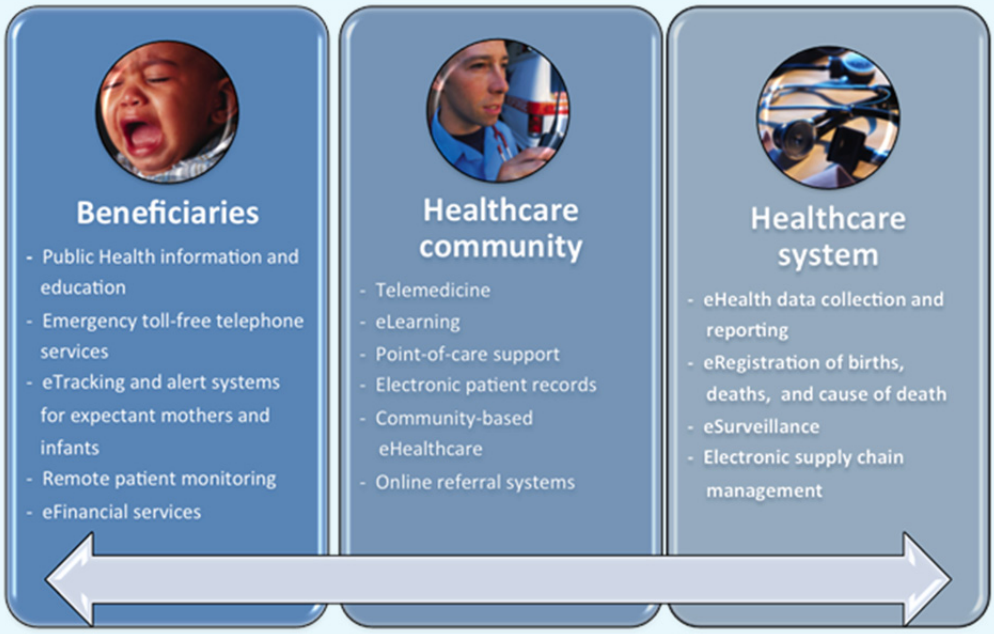


Таблица 2: Электронное здравоохранение и инновации в области ИКТ на протяжении всего континуума помощи ВОЗ

A. Услуги электронного здравоохранения, оказываемые отдельным лицам, новым и будущим матерям, младенцам, их семьям и группам

Инновации и услуги в области ИКТ	Примеры услуг ИКТ, оказываемых на протяжении всего континуума помощи ВОЗ				Примеры проектов электронного здравоохранения в странах CoIA[10]
	До беременности	Беременность	Роды	Послеродовой период	
Информация и обучение в области общественного здравоохранения • Телефонные справочные центры и телефоны горячей линии • Местное радио • Обучение и информирование по вопросам здравоохранения на базе SMS/IVR • SMS и социальные сети для изменения поведения и поддержания связи	Доступ к информации об охране репродуктивного здоровья Поддержка позитивных изменений в поведении в отношении здоровья, например, соблюдение интервалов между деторождениями Стимулирование запросов об охране репродуктивного здоровья	Предоставление советов о надлежащем наблюдении и общей информации о беременности Поддержка профилактических мероприятий и лечения ВИЧ/СПИД и других инфекционных заболеваний, передающихся от матери к ребенку Сети психологической помощи беременным женщинам Улучшение доступа и использование услуг охраны материнства беременными женщинами	Стимулирование женщин к поступлению в учреждения, оказывающие квалифици-рованную помощь во время и после рождения ребенка	Доступ к информации о кормлении младенца и ребенка, о чистой питьевой воде, о соблюдении требований гигиены и т. д.	MAMA [2] Text4Baby [40] Служба Medic Mobile [13] Система напоминаний матерям ЮНИСЕФ [42]
Служба бесплатного вызова экстренной медицинской помощи			Улучшить транспортировку беременных и рожениц с осложнениями Доступ к квалифицированной помощи во время родов в случае скорой акушерской помощи		Телефон горячей линии [26]
Системы электронного наблюдения и оповещения для будущих матерей и младенцев • Регистрация пациента • Точное соблюдение предписаний врача • Таймер		Предоставление пренатального совета на всех стадиях течения беременности Напоминание беременным женщинам о предродовых посещениях врача, информирование нянечек о последующих действиях		Регистрация младенца для проведения профилактической прививки Напоминания матерям, требующим послеродового ухода для них самих и для их младенцев Предупреждение о необходимости вакцинации младенца	M-Chanjo [12] MoTech [32] CommCare [21]
Электронные справочники для поставщиков медицинских услуг • База данных о больницах и клиниках • База данных о работниках здравоохранения	Улучшить быстрый доступ к услугам здравоохранения на протяжении всего континуума помощи ВОЗ				Hospitalsworldwide.com http://www.hospitalsworldwide.com/ OBGYN.net http://www.obgyn.net/
Дистанционное наблюдение за пациентом		Обнаружение и мониторинг сигналов оповещения и типичных симптомов осложнения беременности		Лечение рожениц с осложнениями и уход за ними на дому	Amanece [16] RapidSMS [35]
Электронные финансовые услуги	Предоставление возможности женщинам сэкономить деньги для ухода в предродовой и постнатальный период	Оплата медицинских услуг, связанных с дородовым наблюдением, например консультации, диагностика, лабораторные анализы и т. д.	Оплата медицинских услуг, связанных с родами, например транспортировка и стационарное лечение	Оплата услуг, связанных с послеродовым уходом, например профилактических прививок детей	Система здравоохранения 20/20 [27] Медицинская "умная" карта Changamka [20]

[10] Проекты электронного здравоохранения, перечисленные в этой таблице, более подробно описываются в Приложении III. Номера в скобках соответствуют номеру проекта в Приложении III.

B. Услуги электронного здравоохранения, предоставляемые поставщикам медицинских услуг, медицинским центрам, работникам здравоохранения, врачам, медицинским сестрам и акушеркам, а также медико-санитарным работникам (CHW)

Инновации и услуги в области ИКТ	Примеры услуг ИКТ, оказываемых на протяжении всего континуума помощи ВОЗ				Примеры проектов электронного здравоохранения в странах CoIA
	До беременности	Беременность	Роды	Послеродовой период	
Телемедицина • Аудио-/видеоконференции • Телеэхография, решения телекардиологии и т. д. • Дистанционная диагностика		Обнаружение и мониторинг сигналов оповещения и типичных симптомов осложнения беременности Дистанционное акушерское ультразвуковое обследование	Доступ к специально подготовленному медицинскому персоналу в случае, требующем неотложной помощи	• Рентгеноскопия/взятие проб на ВИЧ, сифилис и другие заболевания • Ускорение отправки результатов анализов для осуществления ранней диагностики младенцев	• CliniPak [22] • SMART [38] • TulaSalud [41] • RAFT [34]
Электронное обучение • Онлайновые учебные материалы • Вопросы по SMS • Обучение на базе SMS/MMS/IVR	Профессиональная подготовка CHW по вопросам охраны репродуктивного здоровья	Профессиональная подготовка CHW по вопросам здоровой беременности и родов	Обучение родам для специалистов, оказывающих первичную специализированную акушерскую помощь	Профессиональная подготовка CHW по вопросам ухода за новорожденными и детьми в раннем возрасте	• AMREF http://www.amref.org/
Поддержка в месте оказания медицинской помощи • Системы поддержки решений (например, контрольные перечни вопросов и алгоритмы)		Скрининг на предмет выявления факторов осложнения беременности Повысить эффективность диагностики и лечения на протяжении всего континуума помощи на основе ведения протокола		Комплексное управление болезнями детей в возрасте до 5 лет	• Электронное комплексное управление детскими болезнями с использованием D-Tree [10] • SMART [38]
Электронные истории болезни • EHR, EMR, PHR	Обеспечение возможности полной интеграции данных истории болезни на протяжении всего континуума помощи				
Медицинское обслуживание, ориентированное на потребности местного населения	Сбор обычных данных о пациентах во время посещения ими больницы или на дому для отслеживания показателей здоровья на местном уровне Ведение пациентов Регистрация и отслеживание состояния будущих матерей и рожениц и отправка предупреждений в случае патологий Управление кадрами, контроль качества работы и стимулы Совершенствование прохождения обратного информационного потока на местный уровень Улучшение коммуникационных и медицинских навыков между медицинскими учреждениями и акушерками				• Childcount+ [8] • CommCare [21] • Pesinet [33] • Акушерки в Ачех Безар [6]
Системы получения советов врача • Закрытая сеть вызова • Онлайн или на базе SMS			Консультирование и транспортировка беременных и рожениц с осложнениями в учреждения, обладающие соответствующими ресурсами Доступ к квалифицированной помощи во время родов		• SHINE [37] • EhealthPoint [23]

C. Услуги электронного здравоохранения, предоставляемые руководителям и администраторам системы здравоохранения для укрепления систем здравоохранения

ICT innovations and services	Примеры услуг ИКТ, оказываемых на протяжении всего континуума помощи ВОЗ				Примеры проектов электронного здравоохранения в странах CoIA*
	До беременности	Беременность	Роды	Послеродовой период	
Электронный сбор и передача медицинских данных • Онлайновая система медицинской информации • Структурированные формы сбора данных с помощью SMS или мобильных телефонов	Сбор, агрегирование и анализ медицинских данных о запросах, касающихся планирования семьи	Сбор, агрегирование и анализ медицинских данных о распространении ВИЧ-AVR средств среди беременных женщин и о посещениях ими врача для получения антенатальной помощи	Сбор, агрегирование и анализ медицинских данных об оказании квалифицированной медицинской помощи при родах, а также о послеродовом уходе за матерями и детьми в двухдневном возрасте	Сбор, агрегирование и анализ медицинских данных о полностью грудном вскармливании, профилактических прививках, об антибактериальной терапии детской пневмонии и о распространенности заболевания остановки в росте	• Онлайновая отчетность национальной миссии по изучению медицинского обслуживания сельского населения, штат Пенджаб, Индия http://www.pbnrhm.orh/online_reporting.aspx
Электронная регистрация случаев рождения, смерти и причин смерти			Регистрация случаев рождения, смерти и причин смерти		• Электронный округ Капуртхала, Индия [1]
Электронное наблюдение			Уведомление о случаях материнской и детской смертности, анализ и наблюдение	Наблюдение за случаями материнской и детской смертности, связанной с менингитом, малярией, диареей или питанием	• Проект Мвана [4] • m-Care [11]
Электронное управление поставками	Управление запасами продуктов охраны репродуктивного здоровья	Управление запасами жизненно важных товаров[11]	Управление запасами жизненно важных товаров	Управление запасами вакцин, средств против малярии, диареи и т. д.	• SMS для жизни http://www.rbm.who.int/

[11] http://www.everywomaneverychild.org/resources/un-commission-on-life-saving-commodities/life-saving-commodities.

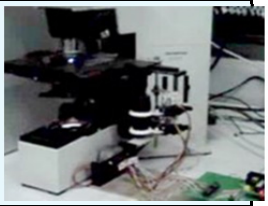
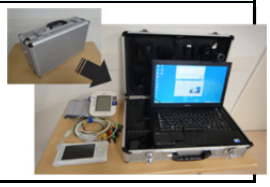
3 От развивающейся страны к развивающейся стране – Уроки, извлеченные из реализации передового опыта

В настоящей главе содержится краткая информация о рабочих моделях служб электронного здравоохранения, уже разработанных и внедренных (или находящихся на стадии внедрения) в некоторых развивающихся странах. Они могут послужить в качестве "передовых методов" для других стран, ибо нет нужды изобретать колесо.

3.1 Пример передовых методов Государств-Членов, участвующих в изучении Вопроса 14-3/2

Помимо информации, представленной в Таблице 2, более подробная информация о достижениях в области электронного здравоохранения некоторых стран содержится в Приложениях к настоящему отчету. В Таблице 3, ниже, содержится наиболее важная информация. Рекомендуется ознакомиться с полными текстами.

Таблица 3: Примеры передовых методов Государств-Членов

Где	Что	Области
Аргентина	Широкий диапазон услуг электронного здравоохранения Опыт применения программного обеспечения с открытым исходным кодом	Национальная сетевая телепедиатрия Электронные истории болезни Заключения другого врача Программное обеспечение с открытым исходным кодом для синхронного обучения и телеконсультаций, позволяющее также осуществлять хирургические операции и ультразвуковые передачи Наблюдения за пациентом после проведения хирургической операции >5 000 приложений электронного здравоохранения для различных моделей смартфонов
Кот-д'Ивуар	Электронное обучение	Подготовка молодых научных сотрудников в научно-исследовательских центрах и государственных университетах
Гвинея	Онлайновые услуги – электронное здравоохранение, электронное обучение	Часть Панафриканской сети, соединяющей 53 члена Африканского союза, чтобы обеспечить эффективную связь и соединения между соединенными государствами. Достижения: Проект в области электронного обучения реализован на 95% Проект в области электронного здравоохранения определен и находится на стадии реализации – 90%
Индия	Все аспекты электронного здравоохранения	Электронные истории болезни и автоматизация госпиталя Широкий диапазон услуг телемедицины и электронного обучения Создание онлайновой библиографии открытого доступа Успешные шаги по стандартизации телемедицины и разработке законодательства по телемедицине Комплект материалов по мобильному здравоохранению 
Индонезия	Телерадиология и телediагностика	Существующая система архивирования и передачи снимков с громадной емкостью хранилища и с эффективной степенью сжатия 16:1, сохранением качества восстановленного изображения Недорогой сканирующий микроскоп с автоматическим определением FoV (область видимости) для систем раннего обнаружения туберкулеза 
Япония	Электронная врачебная сумка	Способна легко отправлять биологические данные пациента с изображение высокой четкости в мобильной среде 

Где	Что	Области	
Япония	Многофункциональная электрокардиографическая радарная система	Мобильная телемедицинская система для передачи в режиме реального времени данных ЭКГ в 12 отведениях и реального видео из движущейся кареты скорой помощи в госпиталь. Эта система позволяет осуществлять измерения, анализ и передачу данных электрокардиограмм (ЭКГ) в 12 отведениях даже в случае артефактов, связанных с быстрым движением, а также во время сердечно-легочной реанимации	
Кыргызская Республика	Помощь в области телекардиологии, охраны материнства и детства	Круглосуточная медицинская помощь национальных центров здравоохранения, располагающих высокопрофессиональным медицинским персоналом, наиболее отдаленным районам страны Профессиональное обучение и подготовка в области ИТ для медицинского персонала	
Лаосская Н.Д.Р.	Расширение существующей сети электронного правительства за счет электронного здравоохранения	Дистанционное консультирование центральной больницей больниц в провинциях Электронное обучение врачей, медицинских сестер и другого медицинского персонала	
Ливан	Мобильные приложения общественного здравоохранения	Приложения включают: – Перечень лекарственных препаратов (проверка цен, доз, форм, легальности...) – Государственные/частные клиники и справочник центров по оказанию первичной медико-санитарной помощи – Министерство здравоохранения и кампании по охране здоровья – Советы по ведению здорового образа жизни и т. д.	
Мали	Пилотные проекты в области электронного здравоохранения на всех уровнях пирамиды по охране здоровья	Телелечение – мобильный парк (медицинские работники на периферийном уровне располагают 500 мобильными телефонами) для оказания медицинских услуг с уделением особого внимания детям в возрасте моложе 5 лет и охране материнства Электронное обучение и телеобучение через динамические веб-порталы	Ответственный орган – Национальное агентство по телездравоохранению и медицинской информации
Пакистан	Сеть телеконсультаций на основе спутниковых соединений Телемедицина неотложной помощи	Телеконсультирование в области рентгенологии, хирургии, медицины, кардиологии, отоларингологии, дерматологии, психиатрии и ортопедии Электронное обучение – Центр повышения профессиональной квалификации врачей и медсестер	
Панама	Технология генерирования и электронные услуги для устойчивого и доступного охвата цифровыми технологиями – проект LUCY	Обеспечение того, чтобы каждый, кто сталкивается с проблемами доступности ввиду своих ограниченных возможностей, неграмотности или старения, независимо от экономических ресурсов, мог иметь доступ к интернету и использовать его, а также всю содержащуюся в нем информацию, к услугам, связанным с образованием, занятостью, повседневной жизнью, участием в гражданской жизни, охраной здоровья и безопасности	www.lucytech.com
Танзания	Телеконсультирование и телеобучение	Основано на национальной волоконно-оптической магистральной инфраструктуре, соединяющей все районы страны Консультирование через мобильные телефоны или интернет Видеоконференц-связь: представление клинических случаев, постоянное медицинское обучение в области клинической патологии	Национальный комитет здравоохранения, ответственный за координацию инициатив в области телемедицины

Где	Что	Области	
Турция	Внедрение электронного здравоохранения на основе успешного сотрудничества между компаниями электросвязи, госпиталями и компаниями-разработчиками программного обеспечения	Круглосуточное предоставление услуг – информация о дежурных аптеках, консультации по поводу здоровья, бесплатный доступ к полностью оборудованной карете скорой помощи в любое время и в любом месте, медицинское страхование Внедрение единой информационной системы управления здравоохранением	
Узбекистан	Внедрение информационных систем управления здравоохранением	Улучшение доступа к административным, медицинским и эпидемиологическим данным; создание возможностей для более эффективного функционирования организаций здравоохранения и медицинских учреждений	Ответственный орган – Министерство здравоохранения
Замбия	Приложения мобильного здравоохранения	На основе открытых исходных кодов; ранняя диагностика детей младшего возраста (результаты анализов сухой капли крови на ВИЧ) и наблюдение за пациентом в рамках послеродового ухода, улучшенная связь между поставщиками медицинских услуг	Ответственный орган – Министерство здравоохранения

3.2 Профессиональная подготовка в области электронного здравоохранения в качестве поддержки различным странам: 10-летний опыт работы МСЭ в области краткосрочной медицинской подготовки

[12] Токийский университет (Япония) совместно с БРЭ МСЭ (Бюро развития электросвязи) организовали курс подготовки для медицинских и патронажных медицинских работников из развивающихся стран, чтобы понять существующие тенденции и технологии в области телемедицины и электронного здравоохранения и заложить основу для внедрения услуг телемедицины.

Этот курс организован Токийским университетом при финансовой поддержке Японского агентства международного сотрудничества (JICA) и Sasakawa Peace Foundation. Участники курса познакомятся со специальными знаниями и средствами в Токийском университете, который активно работает в области международной телемедицины и электронного здравоохранения, а также с опытом реализации проектов МСЭ/БРЭ. Существует два вида программ:

- Долгосрочные программы профессиональной подготовки лиц после окончания докторантуры.
- Краткосрочные программы профессиональной подготовки.

За период с 2002 года профессиональную подготовку в рамках программы после докторантуры получили 10 участников (один – из Бутана, один – из Гаити, четыре – из Индонезии, один – из КНР, два – из Пакистана и один – из Парагвая). Программа состоит из четырех частей:

- распространение результатов научных исследований в области телемедицины и внедрение телемедицины;
- совершенствование оборудования электронного здравоохранения и знакомство других стран с опытом развития и развертывания электронного здравоохранения в Японии;
- расширение и изучение возможностей научных исследований в области телемедицины;

[12] Автор вклада: Юити Исибаси, медицинский факультет Токийского университета, Япония. См. Документ RGQ14.3.2-INF-0022.

- усиление администрирования и управления с описанием и внедрением приложений электронного здравоохранения.

Курс подготовки для представителей стран островов Тихого океана включает краткосрочные программы профессиональной подготовки при поддержке SPF. Перед началом этого курса преподаватели посетили острова, чтобы побеседовать с потенциальными слушателями, оценить их заинтересованность и базовые знания и отобрать подходящих кандидатов (слушателей). По прибытии в Японию слушатели остановились в общежитии Университета для иностранных студентов и прошли программу в университетском городке Shonan Токийского университета продолжительностью приблизительно в 3 месяца. В процессе обучения были использованы два различных подхода: метод лекций и практических упражнений для основного содержания; и метод лекций и показа для дополнительного содержания. Лекции были прочитаны перед каждым тренировочным занятием. Мы посчитали, что обучение на базе практических упражнений, а также метод проб и ошибок были важны для участников, поскольку позволили им усвоить подаваемый материал и добиться его основательного усвоения. Поэтому для участников организовывались с необходимой периодичностью самостоятельные практические занятия. Каждому участнику были предоставлены компьютеры, программное обеспечение и интернет-соединения.

Содержание обуения

Мы подготовили программу обучения, основанную на нашем предыдущем опыте (учебно-методическая помощь), например в Бутане и Бангладеш. Для этого мы задействовали многие виды программных и аппаратных средств. Что касается программных средств, то основной упор мы сделали на сбор, анализ информации и обмен ею. Что касается аппаратных средств, то для медицинской области требуются датчики и аппаратура ЭКГ, а для островных стран необходима беспроводная ЛВС.

За трехмесячный период трудно получить технические знания, достаточные для создания практической системы электронного здравоохранения. Поэтому основной упор мы сделали на обеспечение общего понимания широкого диапазона технологий, с тем чтобы участники могли выбрать из них подходящие приложения для своих стран.

Базе данных и GIS (географические информационные системы) было уделено большое внимание на лекциях по программному обеспечению. В докладе ВОЗ за 2005 год, Глобальная обсерватория по электронному здравоохранению, говорится, что электронное здравоохранение – это составное поле ИКТ и что это поле содержит 10 элементов. Первым элементом является электронное здравоохранение, а вторым – GIS, поскольку GIS важна с точки зрения эпидемиологии. Мы уделили достаточное время лекциям и упражнениям с базой данных и GIS, поскольку GIS полезны для профилактики инфекций и ведения болезней во многих регионах, и анализ информации, накопленной в базе данных, имеет важное значение. Слушатели изучили Microsoft ACCESS и ArkGIS и разработали простую систему, в которых накоплена и отображена медицинская информация их стран в этой базе данных. На практике это должна быть система на базе веб. Поэтому важно, чтобы соответствующая информация была в конечном итоге размещена и отображена в веб-системе. Участникам важно научиться организовывать и представлять информацию. Система этой программы представлена в Таблице 4.

Ситуация в странах островов Тихого океана – принципиально отличная. На Фиджи необходимо сотрудничество между двумя крупными и многими более мелкими островами. Население островов многочисленно, и имеется относительно большое количество медицинских работников. Поэтому важно подумать об электронном здравоохранении на дому. В Науру около 10 000 человек проживают на одном острове, и имеется мало медицинских работников. Необходимо подумать о налаживании систем электронного здравоохранения между Науру и развитыми странами, такими как Австралия.

Слушатели усвоили содержание лекций, рассмотрели вопрос о применении технологий в своих странах и после прослушивания лекций написали отчеты на самостоятельных практических занятиях. Их странам трудно внедрить технологии электронного здравоохранения, используя

средства собственного бюджета. Необходима техническая и экономическая поддержка со стороны развитых стран. Мы рассчитываем на то, что идеи, высказанные в их отчетах, помогут получить поддержку со стороны японского правительства, например JICA.

Результаты

Курс обучения был хорошо организован, и материалы и учебные пособия хорошо подготовлены за три года. Помимо этой программы существуют и другие аспекты, которые необходимо рассмотреть, чтобы этот курс обучения принес пользу. Отсутствие инфраструктуры ИКТ, типичное для развивающихся стран, может оказаться препятствием на пути практической реализации этой учебной программы и любых других аналогичных учебных программ. Поэтому мы настоятельно рекомендуем при любой соответствующей организации следовать этой программе с развитием инфраструктуры ИКТ.

Таблица 4: Курс обучения

Классификация	Схема	Тема
Программные средства	Сбор, накапливание, анализ и представление информации	Производство изображения и картины Анализ данных с использованием языков программирования R и MATLAB База данных, использующая Access Интерактивная мультимедийная программа для электронного здравоохранения (HTML) Географическая информационная система, использующая ArcGIS
Аппаратные средства	Связь и датчик	Связь Датчик Беспроводная ЛВС
Темы	Существующие системы, связанные с электронным здравоохранением и международной помощью	Телекардиология в Бутане Система телеконференц-связи Тенденции в электронном здравоохранении ВОЗ и МСЭ Фонд универсального обслуживания для электронного здравоохранения План ОПР японского правительства

Страны островов Тихого океана обладают многочисленными характерными особенностями, например малочисленным населением, проживающим на рассеянных островах, и ограниченными ресурсами. Страны островов Тихого океана сталкиваются с общей проблемой наличия весьма ограниченных ресурсов для внедрения сетей и услуг ИКТ, которые могли бы повысить качество услуг здравоохранения. Поставщики медицинских услуг на островах нуждаются в стартовом капитале, чтобы начать планирование и внедрение сетей и приложений ИКТ, а также для осуществления профессиональной подготовки в области ИКТ врачей, медицинских сестер и постоянного врачебного персонала больниц.

Мы надеемся, что курс обучения, описанный здесь, отчасти помог подготовить эти людские ресурсы, однако за три года его прослушали только шесть человек. Мы надеемся расширить и продолжать этот проект на протяжении длительного периода времени. Имеются общие проблемы состояния медицины, однако были выявлены и некоторые отличные проблемы. Например, многие острова Фиджи и Кука обозначены точками, и поэтому важно создавать сети внутри островов. В Науру имеется только один остров с периметром в 18 км и очень небольшим количеством врачей; поэтому, здесь необходимы консультации опытных врачей из других стран. Через этот курс обучения мы можем оценить нынешнюю медико-санитарную обстановку на островах Тихого Океана, получить необходимый материал для анализа этой ситуации и найти необходимые решения для ее улучшения.

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4 Выводы и рекомендации

Электронное здравоохранение стало уже насущной потребностью, и обратного пути нет. Это фантастическая задача на будущее, однако, чтобы ее решить, требуется сотрудничество и координация усилий на всех возможных уровнях, установление контактов и планирование, готовность учиться у других и не нужно изобретать колесо.

Опираясь на свой многолетний опыт, МСЭ и, в частности, Вопрос 14-3/2, всегда подчеркивал, что есть некоторые наиболее важные условия для успешного внедрения электронного здравоохранения:

- Тщательный предварительный анализ потребностей и имеющейся инфраструктуры, ибо каждый отдельный регион или каждая страна имеют отличающиеся потребности, свою собственную организацию системы здравоохранения и административную организацию, свои ожидания и т. д.
- Игнорирование местных традиций и культурных особенностей может разрушить даже самый хорошо подготовленный бизнес-проект.
- Настоятельно рекомендуется участие местных/национальных авторитетных лидеров.
- Одним из условий успеха является сохранение, а не разрушение существующей системы здравоохранения.
- Подражание – не лучший путь! Пример: Решения, широко использовавшиеся в развитых странах, не всегда являются тем, что необходимо развивающимся странам!
- Установление контактов крайне важно. Представление о том, что происходит в мире в области электронного здравоохранения, помогает специалистам:
  - выйти на общий уровень понимания и знаний и поддерживать его при оказании влияния на местную политику в том, что касается роли электронного здравоохранения в секторе здравоохранения;
  - информировать общественность об электронном здравоохранении и его возможностях;
  - вести конструктивный полезный диалог и добиться многостороннего консенсуса в отношении принципов, политики и стратегий эффективного, подходящего в техническом отношении и учитывающего культурные особенности внедрения электронного здравоохранения.

Роль Вопроса 14-3/2 весьма ценна в том, что касается его способности и готовности предоставить качественные специальные знания и совет, мобилизовать специальные ресурсы и подтвердить надежность и эффективность электронного здравоохранения, когда и если это потребуется.

Исходя из опыта, накопленного за время существования Вопроса 14-3/2, лицам и директивным органам, отвечающим за разработку политики в области здравоохранения в развивающихся странах, важно было бы учесть следующие рекомендации:

4.1 Вопрос 14-3/2 2013 – Рекомендации

В настоящее время все развивающиеся страны достигли такого уровня осведомленности о решениях и услугах электронного здравоохранения, который требует осуществления дальнейших шагов по практическому внедрению этих передовых технологий в интересах их граждан.

- [13] Ускорить принятие дальнейших мер по оказанию содействия в повышении информированности директивных органов, регуляторных органов, операторов электросвязи, доноров и клиентов о роли информационно-коммуникационных технологий в улучшении доступа к услугам здравоохранения в развивающихся странах.
- Стимулировать сотрудничество и заинтересованность сектора электросвязи и сектора здравоохранения, чтобы максимально эффективно использовать ограниченные ресурсы с обеих сторон для внедрения в медицинскую практику услуг и решений электронного здравоохранения.
- Содействовать созданию возможностей для налаживания связей и передачи знаний в области электронного здравоохранения (техническая часть).
- Содействовать получению знаний об охвате электронного здравоохранения и будущих этапах обеспечения лучшего доступа к медицинским услугам, о тенденциях и новейших технологиях и т. д.
- Стимулировать ликвидацию неграмотности в области электронного здравоохранения среди всех заинтересованных сторон, включая граждан.
- Стимулировать инновации, используемые в ряде медицинских учреждений;
- Стимулировать наиболее эффективное использование технологий взаимодействия, причем усиление внимания помощи всем заинтересованным сторонам позволяет осуществлять это взаимодействие. Основной общей ролью здравоохранения должно быть сообщение. Пациенты сообщают симптомы, а поставщики услуг сообщают лечение.
- Поощрять участие медицинского персонала в деятельности МСЭ в области электронного/мобильного здравоохранения.
- Активно распространять в развивающихся странах опыт и передовые методы использования информационно-коммуникационных технологий в электронном/мобильном здравоохранении с упором на применение удобных, надежных, недорогих и энергосберегающих систем, например на базе современных интегральных микросхем.
- Продолжать создание сети экспертов, назначаемых для поддержания связей с исследованиями, касающимися технологий и приложений электронного/мобильного здравоохранения, с тем чтобы ускорить их внедрение в развивающихся странах.
- Определить различные методы, используемые при разработке решений электронного/мобильного здравоохранения, и подготовить полный перечень технических платформ электронного/мобильного здравоохранения, предназначенных для оказания различных медицинских услуг, с учетом сетей электросвязи, имеющихся в развивающихся странах.
- Разработать набор критериев для оценки проектов/услуг в области электронного здравоохранения с упором на используемые технологии и качество услуг в развивающихся странах.
- Активно содействовать разработке технических стандартов для применения электронного/мобильного здравоохранения совместно с МСЭ-Т и, в частности, разработать руководящие указания для развивающихся стран о том, как пользоваться такими стандартами/рекомендациями.

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- Уделять должное внимание экономической оценке пилотных проектов в области электронного/мобильного здравоохранения в развивающихся странах и стимулировать участие частного сектора в развертывании электронного/мобильного здравоохранения.
- Стимулировать ликвидацию неграмотности в области электронного/мобильного здравоохранения среди всех заинтересованных сторон путем включения этой темы в программу многих семинаров и семинаров-практикумов БРЭ.
- Кроме того, в рамках Вопроса 14-3/2 2-й Исследовательской комиссии МСЭ-D настоятельно рекомендуетcz директивным органам развивающихся стран использовать, если и когда это применимо, комплект материалов по национальной стратегии в области электронного здравоохранения МСЭ-ВОЗ.

4.2 Комплект материалов по национальной стратегии в области электронного здравоохранения МСЭ-ВОЗ

[14]Потребность в национальном планировании

Опыт показывает, что использование ИКТ для целей здравоохранения требует осуществления стратегических и согласованных действий на национальном уровне, позволяя тем самым максимально эффективно использовать существующий потенциал и в то же время заложить прочную основу для инвестирования и инноваций. Определение основных направлений, а также планирование необходимых детальных действий являются ключом к достижению долгосрочных целей, таких как обеспечение эффективного функционирования, реформирование или коренное преобразование сектора здравоохранения. Центральное место в этой деятельности занимает сотрудничество между секторами здравоохранения и ИКТ как государственными, так и частными. Как основные учреждения Организации Объединенных Наций, занимающиеся вопросами здравоохранения и электросвязи, соответственно, Всемирная организация здравоохранения (ВОЗ) и Международный союз электросвязи (МСЭ) признают важность сотрудничества в решении вопросов электронного здравоохранения на глобальном уровне, что стимулирует страны к разработке национальных стратегий в области электронного здравоохранения: этот комплект материалов поддерживает эти рекомендации.

Министры здравоохранения играют решающую роль не только в удовлетворении потребностей людей в медицинской помощи и защите общественного здравоохранения, но и в сохранении существующих систем здравоохранения на протяжении определенного периода времени. Министры информационных технологий и электросвязи играют ключевую роль в развитии всех сфер и могут внести важный вклад в сектор здравоохранения. Общие цели и предсказуемая среда ИКТ позволяют осуществлять согласованные действия: достижение консенсуса по вопросам политики, стимулирование более эффективного использования общих ресурсов и вовлечение частного сектора, а также инвестирование в знания и инфраструктуру для улучшения результатов мероприятий по охране здоровья.

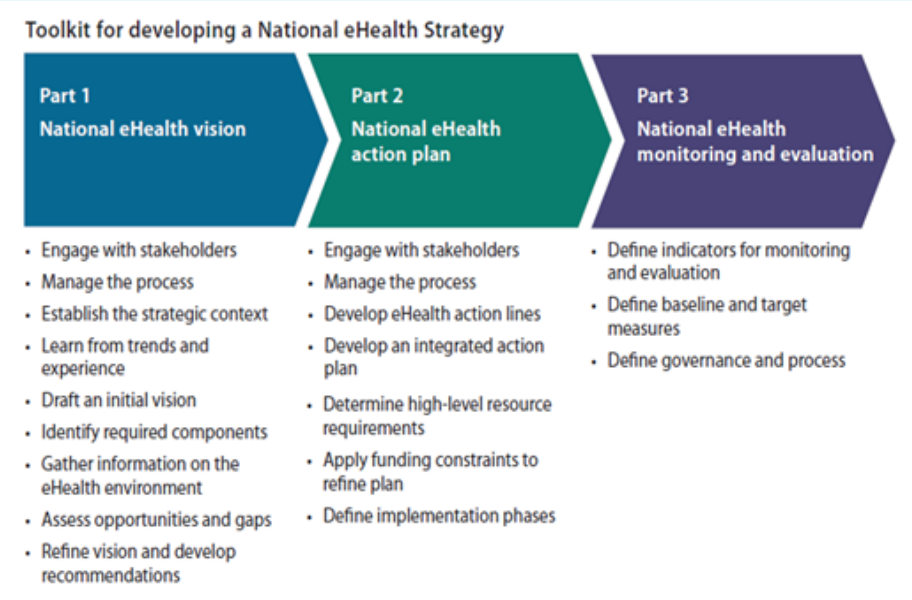
Цель и аудитория

Комплект материалов по национальной стратегии в области электронного здравоохранения является ресурсом, предназначенным для разработки и обновления стратегий стран в области электронного здравоохранения, начиная со стран, которые только ставят перед собой такую задачу, до стран, которые уже вложили значительные инвестиции в систему электронного здравоохранения. Сюда относятся страны, пытающиеся опереться на обнадеживающие результаты пробных инициатив, заложить основы для масштабирования проектов в области электронного здравоохранения или обновить существующие стратегии, чтобы отразить в них меняющиеся условия. Этот комплект материалов может использоваться руководителями государственного сектора здравоохранения в министерствах, управлениях и агентствах, которые будут руководить

[14] Хани Эскандар, координатор БРЭ по Вопросу 14-3/2, ITU/BDT/IEE/CYB. См. Документ SG02-C-0182.

разработкой стратегии в области электронного здравоохранения. Ее применение требует наличия команды опытных специалистов в области стратегического планирования, анализа, связи и взаимодействия с заинтересованными сторонами.

Рисунок 3: Комплект материалов для разработки национальной стратегии электронного здравоохранения



Краткое описание комплекта материалов

Комплект материалов состоит из трех частей, причем каждая часть основывается на работе предыдущей части:

- Часть 1: Предусматривает разработку концепции развития национального электронного здравоохранения, отвечающей целям в области здравоохранения и развития. В ней поясняется, почему требуется национальный подход, какой план будет осуществлен и как он будет разработан.
- Часть 2: Предусматривает разработку дорожной карты реализации, отражающей приоритеты страны и контекст электронного здравоохранения. В этой части приведена структура видов деятельности на среднесрочный период и в то же время закладывается основа действий на длительную перспективу.
- Часть 3: В этой части устанавливается план мониторинга реализации и управления соответствующими рисками, показан прогресс и результаты реализации, а также средства обеспечений долгосрочной поддержки и инвестирования.

В каждом разделе содержится описание требуемых видов деятельности, наряду с практическим советом, основанным на фактическом опыте.

Страны могут осуществлять весь набор видов деятельности или те, которые подходят для их контекста и учитывают их ограничения. То, как этот комплект следует использовать и какими будут конечные результаты, будет зависеть от контекста, приоритетов и концепции той или иной страны.

Комплект материалов доступен по адресам: http://www.itu.int/ITU-D/cyb/app/e-health.html и http://www.who.int/ehealth.

Annexes

Annex I: Case Studies: Lessons Learned from e-Health Implementation

1.1 Argentina: Highlights of ICTs for e-Health in Argentina

1.1.1 Introduction

[1]Accessibility to resources, goods and services in healthcare, regardless of geographical location and socioeconomic status, is one of the key factors to ensure that citizens of every nation effectively exercise their Health of Right. Telemedicine, as long as it involves the provision of health care services using information and communication technologies (ICT) for the prevention, diagnosis and treatment of disease, as well as for research and continuing medical education, has become one of the conceptual developments with the greatest potential for ensuring access to health services that meet appropriate quality and coverage standards.

The purpose of the following presentation is to synthetically describe Telemedicine strategies, programs and projects currently under development in Argentina.

1.1.2 Objectives and Strategies

The geographic and demographic characteristics of the country, the diversity of systems to health care access and the unequal distribution of professional resources and equipment, allow planning strategies in which the use of telemedicine, in the widest sense of Telehealth, assist in ensuring the effective exercise of the Right of Health throughout the hole national territory.

In this regard, it has been deemed necessary:

- To develop Telemedicine tools and to implement Telehealth programs and models with adequate standards of quality, social impact, cost – benefit relationship, and interoperability, which allow all citizens reach a better and more equalitarian health care.
- To promote consensus that may unify criteria that will ensure, in the medium term, a legislative and political regulatory framework of ICT and Telemedicine in Argentina.
- To take advantage of already existing resources and programs, engaging them to new local developments and those more significant at national and international level.

1.1.3 Activities Implemented

From a general perspective, although there are some legislative initiatives, to date the country does not have a policy framework for the implementation of ICT in Telemedicine. Likewise, Telemedicine projects have not always benefited from properly manage or support, suffering the vicissitudes of economic and political changes and progressing sporadically and irregularly.

As background, we can mention the National Program for the Society of Information about ICT inclusion in the public sector. This program supported the National Telemedicine Project (2000) which sought the extension of a telemedicine network, establishing clinical and technological reference centers, deploying new terminals systems and mobile solutions (Resolution 10,869 of the National Communication Secretary–SECOM). The socio-economic crisis of 2001–2002 prevented its realization.

Currently, Argentina has a General Plan for ICT (Resolution 1357/97) leaded by the General Secretary of Communications, several interagency plans related to equalitarian access policies (Argentina Connected,

[1] Contribution: Guillermo Bill, Telehealth Network of the América, Argentina. See document 2/205

Decret 1552, 2010), and Integrated Health Information System (SISA) under the Ministry of Health. The latter is a project of information technology with gradual implementation stages and based on a federal concept, meant to record health facilities, health professionals, research, congenital diseases, immunizations, blood donors and evaluation of health technology.

In an overview of the possible applications of ICT in various sectors concerning national development lines (White Paper on ICT-Project Foresight 2020–2009) the Ministry of Science and Technology (MST) considers e-Health as a paradigmatic shift needed to cope with Argentine Health System deficiencies. To achieve this, a drastic restructuring of the health system is necessary, combining the concepts of Telemedicine and Primary Attention Strategy (APS). In 2010 the MST passed a document entitled "Strategic area for information and communications technologies" (Order 004/10d) where Telehealth is considered as a priority issue.

Regarding the development of telemedicine specific tools, it is appropriate to highlight the background related to electronic health records (EHR). Many Argentine provincial states and municipalities followed the line of free software, such as the Group of Buenos Aires BioLinux and the National University of Rosario.

In the province of Salta, Telecom Argentina implemented, in 2009, a web EHR system for management of primary care (ACUARIO SIGMA), developed by the Iberoamerican Foundation of Telemedicine. This system links 49 public health centers with more than 2,000 users, managing 250,000 HER and scheduling 4,000 patients visits by day. GCBA managed several initiatives coordinated by the Health Information Systems General Directory who created a Telehealth Platform. The province of Santa Fe has a video collaboration platform based on open source software for synchronous training and teleconsultations, also allowing surgeries and ultrasounds transmissions. Similarly, in 1995, the Angel Project created the first complete and free medical software, taking into account the laws for Professional Practice (17132), Digital Signature (25506) as well as the Code of Ethics of the Medical Association of Argentina, being compatible with HL7.

Concerning specific education, we should mention that most of the innovative processes, programs and developments in telemedicine and e-Health are concentrated in the academic units of public medical schools in Buenos Aires, La Plata, Rosario, Cordoba, Mendoza, Entre Rios and Tucuman. The valid curricula to train future doctors at these centers include telemedicine and ICT. Also, there is a residence of Medical Informatics at Italian Hospital of Buenos Aires, Biomedical Informatics at GCBA and a postgraduate degree in Biomedical Computing Introduction at the Italian Hospital of Buenos Aires.

In the health care setting, several major hospitals provide projects and programs where ICT and Telemedicine are protagonists. We must mention the program of referral and contra referral of the Garrahan Hospital, which allows remote communication with pediatricians located in provinces that have joined the National Network Tele-Pediatrics. The hospital established the Latin-American Medical Telepresence Pilot Program and offers a Telemedicine Program in Infectious Diseases.

Mendoza has a Telehealth Network formed by universities, the Ministry of Health and private institutions. The Zaldivar Institute (devoted to ocular surgery) in Mendoza has a telemedicine program for monitoring post-surgical patients, first visits, second opinions and training of residents. The Northeastern University has a telemedicine program designed to support rural doctors in Chaco.

Doctors living in small towns of Córdoba province could reach the portal developed by the Telemedicine Center of the National University of Córdoba (UNC) in order to have second medical opinions. The “Mario Gulich Institute”, emerging as a collaborative initiative between UNC and the National Commission for Aerospace Activities (CONAE), is developing various tools for applications of aerospace information to health care, including risk stratification tools for vector-borne diseases and training programs of health applied geographical processing.

Finally, in a country with 51.891 million subscribers to cellular networks, the concept of m-Health should not be neglected. There are more than 5,000 health-related apps for different smart phone models. In addition, several organizations representing health insurance systems and private prepaid companies

operate with cellular messaging systems for different events, such as doctor's arrival, confirmation of appointments, etc.

In the regional context, since October 2011, the Ministries of Health of Latin America and the Caribbean approved the Regional Strategy and Plan of Action on e-Health, whose development the Panamerican Health Organization, World Health Organization (PAHO/WHO), has the mandate to coordinate. This strategy envisages that by 2017 a large percentage of countries have developed their own ALAC National e-Health strategy and represents a challenge and an opportunity for advancement and mobilization for action in Argentina as in all countries of the Region.

1.1.4 Technologies and Solutions Deployed

The key to establish a national telemedicine project is to take advantage of the already installed technology and new programs under development, to promote professional training and to reach agreements on regulatory requirements. In this sense, the Integrated Health Information System (SISA) appears as a possible starting point for major developments and projects in telemedicine.

A program to be considered of immediate usefulness is the national fiber optic network of the Ministry of Federal Planning, Public Investment and Services. Also depending from this Ministry we can find the Argentina Connected Program, as a comprehensive connectivity strategy as well as the three national communication satellites (ARSAT-1, 2 and 3).

National Universities have developed tools for remote support to patients. The Telemedicine Center of the UNER has prototypes and platforms of great social impact potential and low cost. The Institute of Bioelectronics in Tucumán has developed a Rural Telemedicine Application. The Faculty of Medicine of the National University of Rosario has launched a mobile telemedicine station (ETMo) containing sophisticated diagnostic tools built into a suitcase transportable by air, sea or land, able to provide the physician in disaster and/or geographical detachment situation, diagnostic and therapeutic aid from academic specialist located at the university in real time.

1.1.5 Outcomes Achieved. Challenges and Success Factors

Beyond the technical advances, ideas and projects conceived, the Argentina Telemedicine Community achievement has been sustaining internal stability in their working groups, showing the potential social impact of telemedicine and ICTs related to health topics and, last but not least, progressively installing at institutional and government levels the idea that telemedicine is not only important but essential in a Federal and Democratic Integrated Health System.

The unsolved challenges are related to absence of specific legislation, scarcity of means to finance the various projects, the need to train health professionals in the management of the Telemedicine tools, and the slow incorporation of knowledge about the concept of Telemedicine in potential system users and authorities.

A possible successful alternative should be the integration of efforts, the sheared use of technological equipment and human capital available, with the input from the various government levels, investors and private providers of technical resources, as well as academic and hospital medical staff.

Following this vision, emerged the Telehealth Network of the Americas, an organization developed within the OAS-CITEL, which has been formally joined by all medical schools of public administration, various national high complexity hospitals and Ministries of Health of some provinces.

1.1.6 Lessons Learned and Next Steps

The country current situation, with all its infrastructure developments and policies of inclusion and equity, together with the actions of the State and international organizations, to generate a optimistic picture. That is already assembled and tuned the expert protagonists in e-health, appointed before, working together. Is imminent an remarkable progress of e-Health in the country, involving the National State, international agencies, academic and welfare institutions, and the experts who are developing projects and programs worldwide reference.

1.2 Bangladesh

1.2.1 Introduction

[2]Bangladesh is a densely populated country of around 150 million within an area of 150,000 sq. Kilometres with a per capita income of <1000 USD (700–750). The medical professionals including specialist doctors are mainly concentrated in capital city Dhaka and other large cities along with the concentrated tertiary care hospitals. While most people are still living in rural areas, the disparity in health care delivery is easily apprehended by the distribution pattern of the medical expertise and healthcare facilities. The discrepancy opens the options of either establishing equipped health facilities in rural areas or improving the infrastructure so that the service providers feel motivated to stay in village and impart in health service, or to initiate an alternative to provide quality health care to rural areas. In this very aspect Telemedicine can play a vital in a developing country like Bangladesh. There have been small initiatives from some private organizations like BIRDEM, Medinova Telemedicine, Grameen Telecommunication Network, Bangladesh Telemedicine Services, DNS Telemedicine etc. along with personal correspondence like Canadian expatriate initiative with some professors through Grameen Telecommunication Network. But these are very much sporadic and the results of these initiatives are yet to be tested.

1.2.2 Benefits and Future Opportunities

Computer literacy and skill is an integral part of activities in Telemedicine. However, medical professionals are not sufficiently skilled in computer literacy. Training of the medical professional, establishing infrastructure, initiating basic information system, protracted service system and sustainable feedback of the initiative would enable the vast majority of the medical professionals to get on board.

Cost effective service by staying away from travel and accommodation for investigation and consultancy would have been achieved. The family care environment would also be retained for the patient. The emergency services would have been prompt with specialized consultancy served from central to remote and isolated areas. The physicians working in rural areas get the mental strength of handling the patients in their vicinity and thereby the intellectual faculty development becomes a sustainable process.

The telemedicine service can be incorporated in health service networking system connecting the divisional districts with a central server based network. Through collaboration with developed countries telemedicine service could be widened to monitoring of cardiac, respiratory, diabetic, renal and other patients to combat emergency situation. Interactive Continuing Medical Education (CME) and training programs can be initiated to keep track of the latest advances and applications in medical technology and telemedicine. ITU can play a pivotal role to establish tele-consultation network. Robotic tele-pathology network is a dream with pathologists in Dhaka.

The main obstacles that are currently hindering the effort are security and confidentiality of data management, record keeping skill of the facilities, computer literacy, motivation and attitude of the service providers, scarcity of telemedicine supported equipment, patient awareness of the services, network connectivity and speed, cost of band width, and finally, government initiative, policy and support towards this growing demand of service provision.

1.2.3 Conclusion

Health service in Bangladesh is creeping and crawling with the developing economy albeit geographic barrier has become a live history. Medical knowledge should not be constrained by geographical borders. We want to think globally but act locally to bridge the digital divide.

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[2] Contribution: Syed Muhammad Baqui Billah, MHFW, Bangladesh. See document RGQ14.3.2-INF-0023

1.3 Ghana: Ghana Health Service (GHS) e-Health Enterprise Architecture

1.3.1 Background to the GHS EA Programme

[3]The Government of Ghana through the Ministry of Communications commissioned the development of the national Enterprise Architecture (EA) to serve as the technology blueprint for all Ministries Departments and Agencies (MDAs). It is believed that an EA can deliver that improved focus by enabling more informed decision-making and enhanced collaboration between agencies by highlighting opportunities for common solutions, information sharing and concurrent cost reduction. As part of the process, the GHS EA was also developed to enable the Service implement the appropriate e-Health solutions to improve the delivery of services to citizens.

The GHS is a Public service agency established under Act 525 of 1996 as an autonomous agency responsible for the implementation of national policies under the control of the Minister for Health through its governing Council – the Ghana Health Service Council.

The GHS is an independent body with the freedom and flexibility to carry out is functions defined by the Act. The Service therefore needs to develop the appropriate strategies to support its mandate and the EA provides the perfect platform for the GHS to meet its responsibilities by defining the framework for technology selection and implementation strategy to improve health service delivery in the country.

The GHS EA is more than just technology architecture. It involves different architecture perspectives (Business Architecture, Applications Architecture, Data Architecture and Technical Architecture and security architecture), which are key to the implementation of an e-Health Programme.

The GHS EA describes the underlying infrastructure and provides the framework for aligning business and IT strategies of the GHS, enabling the integration of the GHS with organisations such as the National Health Insurance Authority (NHIA) and other international bodies.

The GHS has since adopted the EA reviewed and modified by GHS-EA review committee and has expressed its desire to start the implementation of the EA. It is generally accepted that EA implementation would enable the GHS meet some of its organisational challenges such as improving the delivery of service across the country and improving the efficiency of the Service.

The document serves as a comprehensive introductory paper covering the key aspects for a national rollout of the e-Health technologies. It also acts as a guide on how the different roles of national and local bodies as well as external consultants and Suppliers in the Programme will be achieved.

The Implementation Programme Strategy defines the necessary structures to minimise the risks of failures associated with technology projects in Ghana. It has been designed to avoid some of the mistakes made by other projects in the health sector, which have cost the government a considerable amount of money without delivering real value.

1.3.2 Programme Scope

The key aim of the e-Health Programme is to give healthcare professionals access to patient information safely, securely and easily, whenever and wherever it is needed. It is an essential part of the drive to improve patient care by enabling clinicians and other GHS staff to increase their efficiency and effectiveness.

The Programme is expected to cover all aspects of patient care, the management of facilities, assets and employees as well as the improvement of business processes under the control of the GHS. The scope of the Implementation Programme will be determined by a number of factors or constraints such as

[3] Contribution: Policy Planning Monitoring and Evaluation Division, Ghana Health Service. See document RGQ14.3.2-C-0012

availability of funds. The Programme must also ensure the interfaces with other stakeholders such as the NHIA are effectively maintained by developing the appropriate solutions.

1.3.3 Key Areas to be Considered

The key areas to be considered include:

- Electronic Health Records (EHR) – an important element of EA is the widespread adoption of interoperable EHR. Effective use of EHR has the potential to positively influence both the quality and cost of health care for the nation. The EHR can improve quality by presenting clinical information and comprehensive patient data to the clinician at the point of care. This allows more informed decisions in a shorter time frame. Additionally, the cost of care can be decreased by streamlining data collection, decreasing the likelihood and associated cost of medical errors and by reducing resources used for duplicative or unnecessary information capture and testing.
- Improving data sharing between the GHS and other national and international agencies. One of the key priorities of the Programme is the implementation of the appropriate data exchange mechanism in SDMX standards that will ensure timely and secure transfer of data between the GHS and the agencies, particularly the NHIA.
- A medical billing system that will enable the health facilities to produce medical bills for the payer organisations such as NHIA. The prompt payment of bills is of immense priority to the GHS.
- The need for the introduction of best in class applications to automate business processes such as Clinical Services, Public Health services, Scheduling and Capacity Management, Operational Research, Performance Management, Monitoring and Evaluation, etc.
- A robust network infrastructure that will enable the GHS to connect the health and administrative facilities across the country.

The overall aim of the GHS EA is to move Healthcare towards a series of easily available, interconnected, reliable and efficient services. The EA is a model on which such solutions can be built.

The GHS EA presents a detailed analysis of the current state of the GHS' business and ICT environments with the aim to improve services provided by the Service. It also provides a roadmap to move away from current applications and supporting technologies to an environment that better meets the current and future needs of the Service.

1.4 Central African Republic: Mise en œuvre du Projet Cybersanté en République Centrafricaine

[4]La République Centrafricaine est un pays enclavé, situé au centre du continent africain. Elle couvre une superficie de 622.984 Km² [18]. Elle partage une frontière commune avec la République du Tchad au Nord, la République Démocratique du Congo (RDC) et la République du Congo au Sud, la République du Cameroun à l'Ouest et la République du Soudan à l'est.

La population est estimée à 4.216.664 habitants.

Seulement 45% de la population a accès aux soins de santé de base.

La RCA est subdivisée en sept régions sanitaires et ces dernières ne sont pas en contact permanent; ainsi si nous arriverons un jour à mettre en place la cybersanté dans ce pays nous allons faire un grand pas dans l'amélioration de la prise en charge des patients.

[4] Lemotomo St Alban, Ministère chargé des Postes, Télécommunications et des Nouvelles Technologies, République Centrafricaine. See document SG02-C-0217

Cybersanté est un terme utilisé aujourd'hui par tout le monde pour décrire l'application des technologies de l'information et des communications dans le secteur de la santé. Il englobe toute une gamme de buts qui vont du purement administratif à la prestation des soins de santé.

1.4.1 Objectifs de la Cybersanté en RCA

La cybersanté fait entrer le système de la santé dans l'ère du numérique et celui-ci atteint ainsi un haut niveau de qualité, d'efficience et de sécurité, elle a pour objectif:

De rendre le dossier patient électronique accessible en tout lieu et en tout temps.

Les personnes en RCA obtiendront un accès sans restriction à leurs propres données médicales grâce à la cybersanté. Le personnel de la santé et les ayants droit peuvent rapidement avoir une vision globale de l'anamnèse d'une personne. Le diagnostic pourra être établi plus rapidement et plus précisément, ce qui pourra sauver des vies en cas d'urgence.

De mettre des services en ligne présentant des informations sanitaires de qualité afin de promouvoir la culture sanitaire personnelle

La simplification d'accès à des informations médicales sûres et qui ont préalablement été évaluées, aide la population à prendre des décisions relatives à sa santé, ce qui a généralement un impact positif sur la santé.

D'instaurer la télémédecine et le télémonitorage dans les sept régions sanitaire du pays: prise en charge et conseils médicaux à distance

La prise en charge du patient et les diagnostics pourront être effectués à distance grâce aux technologies de l'information et de la communication(TIC). Le télémonitorage fait partie de la télémédecine et comprend principalement la surveillance des patient(e)s sans l'aide d'aménagements médicaux.

1.4.2 Les Avantages de la Cybersanté en RCA

La cybersanté améliore la qualité de vie, du travail et du lieu, ce qui représente un facteur économique croissant. Une fois installée et les objectifs atteints, elle va nous présenter plusieurs avantages à savoir:

Avantages médicaux de la cybersanté pour les individus, les corps professionnels et les institutions de la santé.

Le dossier patient électronique, les services en ligne ainsi que les conseils et les consultations médicales à distance amènent de nombreux avantages:

- **pour les individus en RCA**

Avec la croissance de la mobilité, les services en ligne renforcent la culture sanitaire des individus, ce qui les aide à prendre des décisions concernant leur santé et a un impact positif sur leur santé personnelle ainsi que sur leur ressenti.

- **pour les corps soignant et médical**

L'accès rapide aux données du patient aide les médecins autorisés à établir rapidement un diagnostic précis. Il est ainsi possible d'éviter de réaliser plusieurs fois le même examen et des erreurs de prescription de médicaments. Les erreurs de lecture peuvent être évitées grâce à la prescription en ligne. Les pharmacien(e)s ayant un accès contrôlé au dossier du patient peuvent reconnaître rapidement les médicaments auxquels le patient est allergique ou ceux occasionnant des effets secondaires. L'introduction des TIC dans le domaine sanitaire en RCA va aussi permettre aux différents sites de prise en charge des personnes vivant avec le VIH de réduire au maximum le nombre des doublant ce qui permettra au ministère de la santé d'avoir des données fiables quant au VIH en RCA.

- **pour les institutions de la santé**

Les services en ligne du système de la santé facilitent les procédures entre les médecins, les hôpitaux et d'autres fournisseurs de prestation, permettant ainsi de renforcer la coordination entre les différents

acteurs et d'accélérer l'échange d'informations. Un système de santé comportant des processus efficients a une incidence sur les coûts de santé.

Avantages administratifs de la cybersanté dans le domaine de l'assurance maladie.

L'utilisation des TIC dans le domaine de la santé simplifie les procédures administratives, comme par exemple l'émission de factures, et permet ainsi de faire des économies.

Avantages de la cybersanté sur l'économie.

La constitution et le développement systématique de services de santé en ligne va représenter un nouveau secteur de services. Il contribuera à l'amélioration de la santé et constitue également un facteur économique croissant. Dans l'ensemble, la cybersanté améliore la qualité de la vie, du travail et du lieu au sein du pays et ouvre de nouvelles possibilités d'exportation.

1.4.3 Conclusion

La cybersanté est un élément essentiel du renouveau en soins de santé: son application au système de soins de santé centrafricain, grâce aux améliorations de l'accessibilité, de la qualité et de l'efficacité du système, résultera en avantages pour les Centrafricains. Le gouvernement Centrafricain pourra investir dans ce domaine.

Un facteur clé du succès du travail du gouvernement est son solide engagement à collaborer.

1.5 Côte d'Ivoire: La Télémédecine en Côte d'Ivoire

1.5.1 Introduction

[5]A l'instar de nombreux pays, nous avons compris l'importance des NTIC dans le domaine de la médecine. Cependant nous nous trouvons dans une situation difficile, à tel point que de nombreux projets ont été abandonnés. Il s'agit pour nous de faire l'état des lieux de la télémédecine en Côte d'Ivoire, de situer nos besoins et surtout de recenser les projets les plus urgents.

Etat des Lieux

A. La formation

Nous avons des besoins pressants en matière de télémédecine. Dans un premier temps il s'agit d'avoir un personnel qualifié. A ce propos, nous pensons que la formation des ressources humaines (Médecins, infirmiers et informaticiens) pour démultiplier le système de télémédecine à Abidjan et en Côte d'Ivoire est d'une importance capitale. A cet effet, La SIBIM, Société Ivoirienne de Biosciences et Informatique Médical, a voulu mettre en œuvre le plan de formation qui consisterait en l'Organisation d'ateliers de formation à l'intention des professionnels de la santé et des professionnels des NTIC.

Les objectifs de ces ateliers seraient entre autres:

- Mettre à niveau en informatique de base des professionnels de la santé (Word, Excel, Powerpoint, Open Office, Acrobat professional);
- Fournir une vision globale sur les outils de l'informatique médicale;
- Apprendre les bonnes techniques de recherches d'informations médicales en ligne sur les moteurs de recherche;
- Apprendre à créer et à mettre en ligne les cours sur un système de télé-enseignement;

[5] Logbo-Allomo Tania, ATCI, Côte d'Ivoire. See document RGQ14.3.2-INF-0002

- Favoriser l'échange entre les professionnels de la santé et ceux des NTIC par le regroupement lors des ateliers;

Cette formation concernant directement les CHU, (Centres Hospitaliers Universitaires), devra intéresser d'abord les Directeurs Médicaux Scientifiques (DMS), coordonnateurs Télémédecine CHU et les Techniciens Informatiques.

Mais à ce jour, ce projet n'a pas encore été réalisé.

B. Le matériel

Nous manquons cruellement de matériel en Côte d'Ivoire. Le matériel informatique dont dispose les CHU et CHR sont désuets voire quasi inexistants.

Ainsi, nous aurions besoin pour les CHU d'Abidjan et les CHR des régions de Côte d'Ivoire, d'équipements pour la retransmissions de la Télé – soins – enseignements. A savoir, la plate forme site web à partir de laquelle nous pourrions émettre nos cours et assurer les soins à distance, d'ordinateurs, de vidéo projecteurs, d'écrans de projection et de tous les accessoires qui accompagnent ces équipements pour faire de la Télémédecine. Enfin, Et à tout cela il faudra ajouter les bandes passantes: c'est le problème essentiel à résoudre pour faire éclore la Télémédecine en Côte d'ivoire.

C. Le cadre juridique

Nous ne disposons en Côte d'Ivoire a l'instar des pays de la CEDEAO d'aucune réglementation ni de cadre juridique pour la télésanté en Côte d'Ivoire.

Nous avons cependant des acquis.

1.5.2 Les Acquis

En termes d'acquis nous avons:

1) La SIBIM, (Société Ivoirienne de Biosciences et Informatique Médical). Société scientifique et de vulgarisation de la Télémédecine, dans toutes ses composantes mais dont l'accent a été mis sur le Téléenseignement dispensé actuellement par le RAFT (Réseau Afrique Francophone de Télémédecine).

2) Un embryon de Télésanté (équipements et logiciels) au CHU de YOPOUGON (Abidjan) à travers un projet Indien dénommé RPSL. Il s'agit du Réseau Panafricain de Service en Ligne mis en place par l'Inde et 53 pays de l'Union Africaine qui consiste en une connexion par fibre optique et par satellite (RASCOM en l'occurrence) permettant de fournir des services de télé- éducation, télémédecine et de communication diplomatique. La télémédecine devrait à cet effet et entre autres, fournir les services suivants: la téléconsultation, la télésurveillance, la télé-chirurgie, la téléformation, l'éducation Médicale Continue (formation continue de 500 médecins et 1000 infirmiers en 5 ans), les logiciels de gestion des patients, des logiciels de stockage de données et de transmission des dossiers médicaux, la mise en place d'un centre de données devant gérer et tenir les archives. Ce projet rencontre quelques difficultés pour l'instant, compte tenu des circonstances du pays la situation sociopolitique du moment.

3) Projet PASRES en cours de réalisation. Le Programme d'Appui Stratégique à la Recherche Scientifique en Côte d'Ivoire (PASRES) est un programme financé par le Fonds Ivoiro-Suisse de Développement Economique et Social (FISDES). Il a été soumis par le Ministère de l'Enseignement Supérieur et de la Recherche Scientifique (MESRS) et le Centre Suisse de Recherches Scientifiques en Côte d'Ivoire (CSRS). Il vient soutenir le MESRS dans son objectif prioritaire de création d'un Fonds National pour la Recherche Scientifique et Technologique (FNRST) en Côte d'Ivoire.

Le PASRES poursuit quatre principaux objectifs:

- financer des projets de recherche contribuant à la lutte contre la pauvreté;

- former des jeunes chercheurs pour assurer la relève scientifique au niveau des centres de recherche et des universités publiques;
- apporter des appuis aux structures de recherche en matière de réhabilitation des stations et laboratoires, de renforcement des capacités (équipements et connectivité) et d'accès à l'information scientifique;
- donner les appuis nécessaires à l'émergence d'un Fonds National de la Recherche Scientifique et Technologique en Côte d'Ivoire;

La dynamique de mise en œuvre du PASRES donnera des bases solides pour le développement durable de la recherche en Côte d'Ivoire. Le projet viendra revitaliser les capacités des structures de recherche lourdement affectées par la crise.

4) l'Emission de cours au niveau du RAFT depuis 2008.

5) Quelques équipements non fonctionnels.

1.5.3 Les Projets

Dans un futur proche, la Côte d'Ivoire a en projet les actions suivantes:

1) L'Acquisition d'un SERVEUR et Construction d'un site web pour faire de la Télémédecine au plan national;

2) L'Extension des salles où est installé le Projet Indien avec l'acquisition de climatiseurs. A cet effet l'ATCI et le CI-CERT prévoient de réaliser une salle entièrement équipée qui servirait pour le téléenseignement et la formation continue.

3) L'Extension de la Télémédecine vers les hôpitaux de banlieue situés aux alentours d'Abidjan tels que l'Hôpital Protestant de Dabou, celui de Bonoua, et ceux des deux plus grandes villes de l'intérieur, à savoir Yamoussoukro et Bouaké et enfin les CHR à moyens termes.

4) L' Acquisition d'équipements pour les villes suscitées.

5) Un séminaire sur la télémédecine mobile en Côte d'Ivoire afin de recenser les besoins et rechercher les financements pour des unités mobiles qui permettraient de développer la Télémédecine en zone rurale. Ce, pour la prise en charge entre autres, des accouchements, accidents et pathologies telles que le Diabète, l'Hypertension Artérielle (HTA) et le SIDA etc. elle est impérative pour nous.

1.5.4 Conclusion

La télémédecine en Côte d'Ivoire est au stade embryonnaire. Les technologies de l'information et de la communication sont disponibles dans le pays (fibre optique sur toute l'étendue du territoire et d'une couverture réseau (mobile) très étendue) mais sont essentiellement concentrées dans les villes et gros villages; ainsi l'accès au matériel, l'absence de politiques sanitaires spécifiques, de formation et de moyens financiers constituent autant de défis devant être relevés dans la stratégie de déploiement de la télésanté en Côte d'Ivoire.

1.6 Guinea: Projet Panafricain de Service en Ligne (e-santé, e-Education) en République de Guinée

1.6.1 La Mise en Place du Projet

[6]Pour la mise en place du projet:

[6] Kébé Abdoulaye, ARPT, Guinée. See document RGQ14.3.2-INF-0001

1) Le protocole d'accord entre chaque pays africain désireux de participer au projet et le gouvernement Indien.

2) Les documents sollicitant des offres auprès des pays membres pour abriter les super hôpitaux et Universitaire directrices. Lors de la session inaugurale du parlement panafricain tenue à Johannesburg le 16 Septembre 2004, le Président Indien a proposé la mise en place d'un projet.

De réseau de Télécommunication pour connecter les 53 Etats membres de l'Union Africaine dans le but de rendre efficace les communications et la connectivité entre les Etats.

Ce réseau panafricain comprendra les stations VSAT et des réseaux de câbles à fibre optique et permettra de fournir aux membres des e-services avec en priorités la Télémédecine et la TéléEducation.

Trois documents ont été élaborés à l'intention des pays membres par le comité spécial consultatif.

La Guinée a signé le protocole d'accords et fait ainsi partie des 19 premiers qui ont adhéré au projet.

1.6.2 Les Avantages du Projet pour les Pays Bénéficiaires

Les avantages du projet pour les pays bénéficiaires sont entre autre:

- Pour la Télé- Médecine: accès aux soi ns de santé dans des zones éloignés ou isolés,

Accélération des diagnostiques et des traitements, réduction des couts et de l'isolement professionnel des docteurs en zones rurales, meilleurs prise de décision entre malades et médecin traitant spécialiste.

- Pour la Télé-Education : une éducation de haute qualité à partir d'un studio ou les professeurs de niveau supérieur peuvent être réunis, professeurs en formation périodique, une approche pour l'éducation formelle et pour l'alphabétisation des adultes.

Conformément à la clause 5.3 du protocole, nous avons désigné un coordonnateur national et nous avons procédé à la mise en place d'un comité interministériel pour le suivi du projet.

Par la lettre en la date du 05 janvier 2007 adresse à Monsieur le Président de la république de Guinée, le président de la commission de l'Union Africaine a félicité notre pays pour cette démarche et a demandé, pour la mise en œuvre rapide du projet dont la coordination sera assurée par la commission de l'Union Africaine, désignation au niveau national d'un coordonateur, point focal, et la constitution d'une commission interministérielle pour le suivi effectif du projet.

Selon le rapport de la sixième réunion du comité de pilotage du Projet Panafricain de service en ligne, l'évolution du projet à ce jour, sur le plan africain se présente comme suit:

- 52 sur les 53 Etats signataires du protocole d'accord avec le partenaire Indien (TCIL) dont la république de Guinée.
- Sur 51 pays, 14 pays ont terminé l'implantation du projet et l'etat d'implantation évolue dans les 17 autres.
- 46 Pays sur les 51 ont identifié les sites pour les trois e – services (Télémédecine, Télé Education et communication (VVIP), les 4 autres étant 1 à 2 sites prés identifiés.
- Les procédures d'acquisition des équipements et service pour les 51 pays sont achevées.

Les deux autres sites sont en phase d'étude.

L'évolution du projet en République de Guinée se présente comme suit:

La réception des équipements disponibles à la Direction Nationale des Postes et Télécommunications (DNPT);

- L'octroi de la licence e des VSAT et autre formalité réglementaires;
- L'identification et l'installation des trois sites devant abriter le Projet à savoir:
  - Le site de l'Université Gamal Abdel Nasser, siège du projet E-Education installé à 95%.

- Le site de l'hôpital de Donka siège du projet E-Santé identifié et en phase d'installation (90%).
- Du Département des Postes et Télécommunication (VVIP), siège du troisième site également identifié et en phase d'installation (80%).

Dans le souci de pérenniser ce projet, une réunion hebdomadaire est tenue par le comité de coordination national et une autre avec le cabinet de tutelle pour le suivi de l'évolution du projet.

A préciser que toutes ces démarches ont accompagnées des campagnes de sensibilisation à travers des correspondances adressées aux tutelles intéressées.

1.7 India: Telemedicine India Country Report

1.7.1 Introduction

[7]Most telemedicine activities are in the project mode, supported by the Indian Space Research Organization, Department of Information Technology, Ministry of External Affairs, Ministry of Health & Family Welfare and few others are being implemented through state government funding. None of the programmes are being adopted into the health system. A few corporate hospitals have developed their own telemedicine networks. Some of the nationwide projects being taken up by the Ministry of Health in the Government of India are Integrated Disease Surveillance Project (IDSP), National Cancer Network (ONCONET), National Rural Telemedicine Network, National Medical College Network and the Digital Medical Library Network. Telemedicine standardization and practice guidelines are being developed by the Department of Information Technology in the Government of India. A National Telemedicine Task Force was set up by the Health Ministry in the year 2005. The terms of reference covered all aspects of e-Health. Various committees and subcommittees have presented their reports. A follow-up action plan is awaited. The External Affairs Ministry has taken up the Pan-African e-Network Project and the SAARC Telemedicine Network Projects[20].

The National Knowledge Commission, a high level advisory body to the Prime Minister of India formed with the objective of transforming India into a knowledge society, has also set up a Working Group for the development of an Indian Health Information Network. This working group has proposed to design, develop, and integrate an end-to-end electronic health care informatics network framework in India to improve public health, health research, and the delivery of health care. A National Resource Center for Telemedicine & Biomedical Informatics is being developed at Lucknow with the support of the IT department of the Government of India. This will piggyback on the infrastructure of the School of Telemedicine & Biomedical Informatics (STBMI)[2] set up by the Uttar Pradesh state government. Besides meeting the need of capacity building in telemedicine and e-Health for the country, this school will be accepting overseas candidates also. Currently, Diploma Courses are being carried out by the STBMI.

India is acquiring a sizeable market segment in health care BPO (business-process outsourcing) and KPO (knowledge-process outsourcing) industries. It is now preferred as a healthcare destination for neighboring and far-off countries. Most of these patients are being catered to by the corporate hospitals. At the same time, both short- and long-term travel by overseas citizens is increasing for business and tourism purposes which increases the potential for the use of telemedicine and e-Health tools to facilitate exchange of electronic health information between hospitals across the globe. The so called medical tourism is getting a boost.

Orissa Trust of Technical Education and Training (Ottet) takes the lead using modern ICT platform and network in Public Private Partnership (PPP) mode in association with Government of Orissa to provide

[7] Contribution: S.K. Mishra, Department of Endocrine Surgery & School of Telemedicine & Biomedical Informatics, SGPGIMS, Lucknow, India. See document RGQ14.3.2-INF-0004

promotive and preventive healthcare and disease management. Delivery of healthcare services at the door steps of villagers in 51,000 villages of the state is envisaged[32]. Gujarat state government is looking to expand telemedicine network in PPP mode. The state health department of Gujarat is all set to embark on to connect all villages through its telemedicine network. If things go according to plan, all panchayats (HQ of group of villages, first level of government administrative hierarchy) and schools in Gujarat villages would have visual-satellite connections within the next two to three years. National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore and Mysore based K.R. Hospital has established connectivity for their telemedicine project in collaboration with Larsen & Toubro (L&T) Ltd., Bangalore which has gifted telemedicine solutions and equipment worth INR 600,000 to both the medical centers under Corporate Social Responsibility (CSR) initiative. Similarly, in April 2006 under the CSR program of Gas Authority of India Limited (GAIL), a telemedicine project was started linking SGPGIMS, Lucknow with District Hospital of Raibareli, located at a distance of 80 kms with fiber optic cable network. GAIL has upgraded the infrastructure by providing advanced videoconference equipment and designing and constructing a board room for eCME in the year 2010.

1.7.2 Electronic Medical Records and Hospital Automation

The majority of the hospitals in the country are rooted in manual processes, which are difficult to access. The insurance sector demands more efficient health information storage and retrieval. Automation alone can help hospitals to meet these challenges. Electronic Health Record (EHR) and Hospital Information Management (HIS) in India is still in the early growth stage. To start with it is a small market dominated by in-house design, development and implementation of customized solutions developed by software developers. In terms of technology adoption, India is far behind its Asia Pacific counterparts such as Australia, Japan, South Korea, Singapore, and Malaysia. Center for Development of Advanced Computing (C-DAC), an autonomous government scientific organization developed and deployed the first indigenously developed total Hospital Information System (HIS) software in collaboration with Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS)[22], Lucknow in the year 1998. C-DAC's HIS solution is now deployed in various hospitals like Guru Teg Bahadur Hospital (Delhi), Mahatma Gandhi Institute of Medical Sciences (Sevagram, Maharastra). C-DAC has also developed Telemedicine enabled Hospital Information System. Currently, electronic medical records and hospital automation have been rapidly getting adopted in most of the corporate and few public sector hospitals. Health system development projects in state governments aided by the World Bank are promoting rural electronic health records. Tata Consultancy Services (TCS) is developing a suitable solution to maintain electronic medical records (EMR) for the Tamil Nadu State Government[6]. Ministry of Health & Family Welfare has launched an initiative to standardize Electronic Medical Records for the country. The Apollo Hospitals Group is initiating a major project with IBM, to build a national health data network called Health Highway[30] to provide a diverse set of software applications for the healthcare segment. Health Highway will be offered as a hosted solution managed and maintained by IBM and Apollo with hospitals using it on demand via a pay-per-use model. A major thrust for adapting a standardized EMR is likely to come following the National Knowledge Commission's Working Group recommendation. It has suggested developing a common national EHR with a minimal data set and making it available in an open domain to encourage widespread use in the country. This would facilitate standards-based development of a knowledge base.

1.7.3 Telemedicine Initiatives

Department of Information Technology (DIT), Ministry of Communication and IT (MCIT), Government of India

The Department of IT has taken a pivotal role in defining and shaping the future of telemedicine applications in India. The DIT has been involved at multiple levels – from initiation of pilot schemes to standardization of telemedicine in the country. It has funded development of telemedicine software systems – the prominent ones being Mercury® and Sanjeevani® software by C-DAC. DIT has also sponsored the telemedicine project connecting three premier medical institutions – viz. SGPGI-Lucknow, AIIMS-New Delhi and PGIMER-Chandigarh. DIT has established more than 100 nodes all over India in

collaboration with the state governments. Telemedicine network in West Bengal for diagnosis and monitoring of tropical diseases, Kerala and Tamil Nadu Oncology Network for facilitating cancer care, North-Eastern and Himachal Pradesh hilly states for specialty healthcare access are some of the prominent projects launched by this department.

Indian Space Research Organization (ISRO)[3]:

Towards societal benefit of indigenously developed space technology, Indian Satellite System (INSAT), ISRO[3] has implemented telemedicine pilot projects around the country under GRAMSAT (rural satellite) program which are very specific to the development of the society. In collaboration with state governments it has established a Telemedicine Network consisting of 382 Hospitals-306 Remote/Rural. District Hospitals/Health Centers connected to 51 super specialty hospitals located in major states. Sixteen mobile Telemedicine units are part of this network. Andaman & Nicobar Islands and Lakshadweep are linked to mainland specialty hospitals through satellite connectivity. In collaboration with state government it has supported establishment of Karnataka state telemedicine network where all the district hospitals in the state are connected with five specialty hospitals in Bangalore and Mysore. Similar operational network has been effectively functioning in the state of Rajasthan where all the 32 district hospitals are connected with six medical college hospitals and S.M.S. hospital in Jaipur. ISRO has also assisted Maharashtra, Madhya Pradesh and Orissa states in establishing satellite communication based telemedicine pilot projects.

Ministry of Health and Family Welfare (MoH&FW), Government of India[4]:

MoH&FW is currently implementing Integrated Disease Surveillance Programme network connecting all district hospitals with medical colleges of the state to facilitate tele-consultation, tele-education/training of health professionals and monitoring disease trends. It has funded few pilot projects at national level such as; tele-ophthalmology and rural telemedicine projects. OncoNET India project is under implementation which will network 27 Regional Cancer Centers (RCCs) with 108 Peripheral Cancer Centers (PCCs) hospitals to facilitate national cancer control programme. National Rural Telemedicine Network (NRTN) Project under National Rural Health Mission (NRHM) is under implementation phase. Recently, the ministry has decided to implement National Medical College Network project under the central scheme - e-Health including telemedicine in which all the medical colleges of the country will be linked with high speed high bandwidth optic fiber backbone from “National Knowledge Network”. The proposed network will empower learners and teachers to practice distance medical education using various ICT enabled educational technologies. The digital medical library consortium created by the National Medical Library will be able to expand its reach using this network.

State Governments:

To strengthen the healthcare facilities in their states, the governments of Orissa and Uttar Pradesh supported networking of their secondary level hospitals and then further linked them to SGPGIMS, Lucknow for specialty consultation[7]. C-DAC is now implementing the third phase of telemedicine network in Orissa by connecting remaining 22 districts hospitals. State-level central telemedicine resource centre is coming up on the premises of SCB Medical College and Hospital, Cuttack for promoting, monitoring, storing and maintaining entire state telemedicine activities and digital medical contents[18]. The Government of Chhattisgarh with the support of ISRO has established state wide network linking state Government Medical Colleges at Raipur and Bilaspur which in turn have been linked with premier hospitals across the country. Rajasthan State Government also, in collaboration with ISRO, has established Telemedicine network between 6 state medical colleges and 32 district hospitals and 6 Mobile Vans. Karnataka State Telemedicine Network Project run by an autonomous trust formed by the State Government has set up 30 nodes in collaboration with ISRO. Intel has initiated a joint telemedicine programme to take the benefits of healthcare to rural Karnataka in association with the state government[26]. Andhra Pradesh state government is planning to launch mobile clinics that would daily visit two villages to check blood pressure, diabetes and other health parameters of people and also carry out telemedicine through “104 services”. Gujarat is also starting “104 services” over phone. People can call up and talk to paramedics in call centers who can suggest the primary action to be taken in case of any health

emergency. Also, they would be able to suggest generic and over the counter drugs." Punjab government also launched a Telemedicine Project, with state-of-art facilities at Government Medical College and Hospital to link the five polyclinics set up in the state. In Himachal Pradesh 19 health centers at district, block and tehsil headquarters connected with Indira Gandhi Medical College, Shimla and Postgraduate Institute of Medical Education & Research Chandigarh through ISDN link[24]. The Gujarat government will soon launch a Telemedicine Project with the Indian Space Research Organisation (ISRO) as its technology advisor to enhance the quality of healthcare services in the remote areas of the state. Under this project, government plans to cover 50 Community Health Centers, mainly in interior tribal and coastal areas of the state within a year. Later, this facility will be extended to other remote areas[30]. Maharashtra state has deployed Telemedicine network linking 28 District hospitals with Nanavati super specialty hospital under National Rural Health Mission.

Telemedicine Initiatives undertaken by large hospitals: Academic/Public/Corporate

Various tertiary level super specialty hospitals in public and corporate sector have taken initiatives in telemedicine program with the help of government agencies or on their own. Many of them have now completed a decade of telemedicine journey. Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS), Lucknow, a premier academic medical institution in the public sector, started telemedicine activities in the year 1999 in project mode with the support of various government agencies. SGPGI Telemedicine network has linked 27 national and international nodes and has been carrying out tele-education and tele-healthcare activities. Research and development is one of the focus areas at this center. SGPGI has set up a School of Telemedicine and Biomedical Informatics to train man power in the field of telemedicine and e health. Department of Information Technology, Government of India has now recognized it as a National Resource Center in Telemedicine and Biomedical Informatics. All India Institute of Medical Sciences (AIIMS), New Delhi connected with Jammu & Kashmir, Haryana, Orissa, North East states network and PGIMER, Chandigarh connected with Punjab and Himachal state network and Sri Ramachandra Medical College and Research Institute, Chennai connected with Andaman & Nicobar Island Hospital, Amritha Institute of Medical Sciences, Kochi connected with Lakshwadeep island, Tata Memorial Hospital, Mumbai, Christian Medical College, Vellore are involved actively in Telemedicine.

In corporate sector, the major players are Amrita Institute Medical of Sciences (AIMS), Kochi (69 nodes), Apollo Hospital Group (150 nodes), Asia Heart Foundation, Bangalore, Mumbai (02 nodes), Fortis Hospital (20 nodes), Narayana Hrudayalaya (26 nodes), Dr. Balabhai Nanavati Hospital, Mumbai (32 Nodes) and Escorts Heart Institute and Research Center (08 nodes). Recently Sir Ganga Ram Hospital, New Delhi has launched its telemedicine centers in Haryana and Rajasthan states. With the support of ISRO, Shankar Nethralaya at Chennai, Meenakshi Eye Mission at Madurai and four other corporate eye hospitals have launched Mobile Tele-ophthalmology service for early diagnosis and treatment of ophthalmic diseases under National Blindness Control Program. Sir Ganga Ram Hospital, New Delhi and AIMS, Kochi have

launched mobile Tele-hospital for rural access of specialty healthcare services. Hyderabad-based Global Hospitals announced the opening of their information and telemedicine centre in Ahmadabad. The telemedicine centre in the city is the fourth after Kolkata, Puducherry and Bhubaneswar. The telemedicine centre will help them to reach out to the specialists in Hyderabad and Chennai[29].

1.7.4 Example of a successful development is the m-Health Tool Kit for Low Resource Countries

Introduction

With over 506 million mobile phone subscribers in a low resource country like India, growing at approximately 10 million per month, mobile networks have now become the country's largest distribution platform, promising to deliver information and public services to the masses through innovative applications. On current trends, m-Health systems will be more widely offered by mobile telecommunication service providers, and simple, yet important functions may even be offered as built-in features of mobile phones[1]. Mobile platforms world-wide are being used to provide financial and banking services, agriculture information, health services, telemedicine and e-education in rural and remote areas. The initiatives to provide various services using mobile applications have already started in India. m-Health application potential can be leveraged to boost social and economic activities, governance, and enhance government-citizen interaction. For this transformation to be inclusive and beneficial for the under-privileged and rural population, an innovative and low cost model has to be addressed in the context of developing countries.

Material and Method

m-Health4U®, a portable low cost mobile telemedicine kit, was conceptualized, designed and a prototype developed at the m-Health research laboratory STBMI in 2008. Two versions were worked out, i.e. m-Health4U-B (Backpack) and m-Health4U-S (Suitcase) having a weight of 2–4 kilogram depicted in Fig. 1.

After bench testing, a proof of concept study was undertaken in the field to test transmission of vital signs and ECG and software based videoconference using wireless broadband media during a local festival in the month of June 2009 and 2010 (refer to Fig 2. for technical architecture). An enterprise based six node wireless telemedicine network was set up connecting specialty hospitals at Bhubaneswar and Cuttack, and Orissa in the eastern coast of India using wireless broadband network to exchange ECG and carry out videoconference for tele-consultation. The outcome was successful transmission of vital sign data and videoconference. Subsequently, pilot field deployment was carried out in the State of Gujarat, western India in the month of November 2010. In-service paramedical, laboratory technician and nursing staff were identified to carry out the pilot project. Basic orientation, demonstration and hands-on training were imparted to give them first hand exposure on the kit and then the kit was installed in four Primary Health Centers (PHC) and one Community Health Center (CHC). All five nodes were connected over mobile wireless internet with the expert hospital located in the city. The electronic medical record was created using the Curesoft® telemedicine software and the input from integrated medical devices like ECG, NIBP, and Spo2 etc. were captured through USB 2.0 port into this software, which was then exchanged between the nodes, followed by a videoconference session for tele-consultation after the successful transmission of the data to the specialist.

Result

The outcome of the "proof of concept" was quite satisfactory. The doctors involved in the project were quite excited and found it an innovative solution for strengthening the healthcare services at their hospitals. Subsequently pilot deployment was started in a different environment. The patient data was transferred successfully between the expert doctors and remote end and videoconference could be possible even in low bandwidth. The doctors participating in the study suggested some minor changes in the software architecture, like incorporating more graphics to represent body parts. Overall performance of the kit was acceptable to them.

Discussion

The advancement of m-Health technology should be exploited in rural healthcare delivery setting in low resource countries where the mobile telecommunication network has already reached. The tool kit has been developed keeping in mind the basic health care needs in remote villages in an Indian setting, a situation akin to countries in the developing world. Besides the local available technology and skill, cost factor has been taken into account. While field deployment has been successful in testing, the local available mobile network, human factors such as acceptability of the device and operational simplicity were also taken into consideration.

Acknowledgement

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[2] Singh Indra Pratap, Bhagat K N, Mishra S K “Technical Evaluation of Low Cost Telemedicine Solution in Indian Situation: A Case Study in Ratha Yatra Festival at Puri,” Abstract in the Proceedings 5th National Conference of Telemedicine Society of India, Pune, 6-8 November 2009

1.7.5 e-Learning in the-Health Sector

Online Open Access Bibliography:

Two government agencies, the National Informatics Center (NIC) and the Indian Council of Medical Research (ICMR) have established the Indian Medical Literature Analysis and Retrieval System (MEDLARS) Center to cater to the information needs of the medical community of India. This ICMR-NIC Center for Biomedical Information has developed various web-based modules such as a union catalog of the journal holdings of medical libraries of India (http://uncat.nic.in), a bibliographic database of Indian biomedical journals (http://indmed.nic.in) and full texts of Indian biomedical journals (http://medind.nic.in).

Collaborative Knowledge Sharing through Telemedicine Network:

In the interest of professional knowledge sharing, premier academic medical institutions including AIIMS, PGIMER, SGPGIMS, Christian Medical College, at Vellore, and AIMS are actively involved in sharing their academic activities over the telemedicine network.

1.7.6 Education & Training in e Health towards Capacity building:

The Apollo Telemedicine Network Foundation

The Apollo Telemedicine Network Foundation, in collaboration with Anna University in Chennai, was the first to start a 15-day certification course in Telehealth Technology, which is a blend of technical, medical and managerial skills. The first course commenced in October 2003. As part of its efforts to popularize telemedicine, an interactive section on telemedicine has been made available in the division of emerging technologies at the renowned National Science Centre in New Delhi. Thousands of public individuals now have an opportunity to see telemedicine and learn about it.

SGPGIMS

SGPGIMS, in collaboration with the Uttar Pradesh State government and Department of Information Technology (DIT), Government of India, has taken the initiative to set up a School of Telemedicine and Biomedical Informatics in its campus. Curriculum based diploma courses was started in 2009. First batch of the diploma course has finished and second batch is enrolled in this session year. It will house different

laboratories in the field of e-Health such as telemedicine, hospital information systems, biomedical informatics, medical multimedia and image management, medical knowledge management, artificial intelligence, virtual reality, and robotics. The objectives of the school are to create various resource facilities, run structured training programs, conduct research and development, and provide consultancy to government and private health care organizations in collaboration with technological and medical universities in the country and abroad. Five trainees from the Maldives (sponsored by the WHO), 30 Indian trainees sponsored by the government of Madhya Pradesh, and 13 Indian trainees sponsored by the government of Uttar Pradesh learned telemedicine technology and its application in October 2007 and February 2008. Two trainees from the DPR Korea (sponsored by the WHO), 38 Indian trainees sponsored by different organization in 2009 and 69 in 2010. The school is being identified as a "National Telemedicine Resource Center" by DIT.

Tele-training Center at National Institute of Health & Family Welfare, New Delhi

The Ministry of Health & Family Welfare in the Government of India is setting up a teletraining center at the National Institute of Health & Family Welfare in New Delhi to create a facility that will offer tele-training of public health professionals across the country through various e-learning modules. This will enable professionals to switch to more efficient electronic modes from the currently practiced on-site training modules. This initiative would boost capacity building in public health as has been envisaged under the National Rural Health Mission[4].

The National Board of Examinations (an autonomous body under the aegis of Ministry of Health, Govt. of India) offers a satellite-based postgraduate e-lecture program in all medical specialties. It is now mandatory for every institution recognized by the board to make available the necessary infrastructure for receiving these programs.[33]

e-Continuing Medical Education (e-CME)

MoH&FW is planning to network all the government medical colleges with high bandwidth fiber to facilitate an e-CME program.

e-Governance in the Health Sector under the State-wide e-Governance Network

DIT has launched the National e-Governance Action Plan (NeGP) to support the growth of e-governance within the country. The National Informatics Center (NIC) is the DIT arm that provides a range of services to all the government departments at the center, the states and the districts. A separate "e-Governance Standards Division" has been created by NIC to steer the process of evolving the standards.

Common Service Center (100,000 nodes), DIT Project

DIT has formulated a proposal to establish 100,000 common service centers (CSCs) in rural areas, which will serve not only as the front end for most government services, but also as a means to connect the citizens of rural India to the web. CSCs would extend the reach of electronic services, both government and private, to the village level. Various government departments have been advised to design and evolve their mission-mode projects, laying adequate emphasis on services and service levels with respect to their interface with citizens and businesses. Telemedicine has been identified as one of the service modules. It is envisaged that initially, 20,000 CSCs would have tele-health outlet service managed by a village-level entrepreneur.

Village Resource Centre (VRC)

The VRC concept has been evolved by ISRO to provide a variety of services such as tele-education, telemedicine, online-decision support, interactive farmers' advisory services, tele-fishery, e-governance services, weather services and water management. By providing tele-education services, the VRCs act as learning centers focused on the virtual community. At the same time, VRCs will provide connectivity to specialty hospitals, thus bringing the services of expert doctors closer to villages. Nearly 500 such VRCs have been established in the country.

1.7.7 Policy Initiatives

Ministry of Communication & IT

a. Standardization of Telemedicine Platform and Services

To standardize services of different telemedicine centers, a document called "**Recommended Guidelines & Standards for Practice of Telemedicine in India**" has been prepared by DIT. It is aimed at enhancing interoperability among the various telemedicine systems being set up in the country. These standards will assist the DIT and state governments and health care providers in the planning and implementation of operational telemedicine networks. To establish a telemedicine center, standards should be set for telemedicine systems, software, connectivity, data exchange, security and privacy. Guidelines should also be established regarding telemedicine interaction.

b. Defining the IT Infrastructure of Health

DIT also took initiative, in a project mode, for defining **"The framework for Information Technology Infrastructure for Health (ITIH)"** to efficiently address the information needs of different stakeholders in the health care sector.

Initiatives of Ministry of Health & Family Welfare (MoH & FW)

National Task Force on Telemedicine:

1. To work on inter-operability, standards for data transmission, software, hardware, training etc.
2. To define a national telemedicine grid and consider its standards and operational aspects.
3. To identify all players and projects currently involved in telemedicine in India and evaluate their performance, capacity and replicability.
4. To prepare pilot projects for connection of super specialty hospitals/ medical colleges with district hospitals and/or Community Health Centers /Primary Health Centers especially keeping in mind to provide access to remote areas.
5. To prepare national cancer telemedicine network.
6. To examine possibilities of utilization of standalone centers of department of communication in rural areas.
7. To define standards and structures of electronic medical records and patient data base which could be accessed on a national telemedicine grid?
8. To enable telemedicine centers in teaching institutions to impart training to all government medical/dental/nursing colleges in three years time.
9. To prepare curriculum and projects for CMEs through telemedicine.
10. To draft a national policy on "telemedicine and telemedical education" and to prepare a central scheme for the 11th Five Year Plan.

Medical Informatics Education for Graduate Medical Students

The Medical Council of India is considering the introduction of medical informatics in the course curriculum of graduate medical students.

1.7.8 National e-Health Projects under Planning and Implementation

Ministry of Health & Family Welfare Projects

a. National OncoNET Project:

Under the National Cancer Control Program, 27 Regional Cancer Centers will be linked with 100 peripheral centers for primary prevention, early detection, treatment and rehabilitation of cancer patients.

b. National Medical College Network:

The National Task Force on Telemedicine, set up by the Union Ministry of Health and Family Welfare, plans to establish a national grid on telemedicine for networking medical colleges. A few tertiary-care academic medical institutes from different regions of the country will be identified as medical knowledge resource centers (in a regional hub), each of them connected to medical colleges (nodes) in that region. One of these regional hubs will be identified as the central hub, which will have overall responsibility for coordinating the national network in addition to providing infrastructure for a central content development center.

c. National Digital Medical Library Consortium:

The National Medical Library's Electronic Resources in Medicine (ERMED) Consortium is an initiative taken by the Director General of Health Services (DGHS) to develop nationwide electronic information resources in the field of medicine. A total 39 centrally-funded government institutions (including 10 under DGHS, 28 laboratories under the Indian Council of Medical Research, and the AIIMS libraries) have been selected at the initial stage as core members. The MoH&FW aims to provide funds required for the purchase of electronic journals under this consortium project.

Ministry of External Affairs Project:

a. SAARC telemedicine network[20]

The South Asian Association of Regional Cooperation (SAARC), created as an expression of the region's collective decision to evolve a regional cooperative framework, received a major impetus during the 14th SAARC Summit held in New Delhi in April 2007. The pilot project connects one or two hospitals in each of the SAARC countries with three to four super-specialty hospitals in India. The super specialty hospitals in India include the SGPGIMS, Lucknow and PGIMER, Chandigarh which are connected with JDWNR Hospital, Thimphu, Bhutan; Indira Gandhi Child Hospital, Kabul, Afghanistan; and Patan Hospital, Kathmandu, Nepal. This is being developed as an exemplary model for implementing projects at the regional level. It has immense potential to expand the scope of regional cooperation to other ICT enabled areas such as education, business process outsourcing and mass communication.

b. Pan-African e network project:

The Ministry of External Affairs for the Government of India is implementing this project through Telecommunications Consultants India Ltd. (TCIL) to establish a VSAT-based telemedicine and tele-education infrastructure for African countries in 53 nations of the African Union. This will be accomplished via a satellite and fiber-optic network that would provide effective tele-education, telemedicine, Internet, videoconferencing and VoIP services and also support e-governance, e-commerce, infotainment, resource mapping and meteorological services. Ten super-specialty hospitals in India have been identified to provide tele-health services to 53 remote African hospitals. In August 2010, the second phase of the Pan-African e-Network project had been launched[31].

e-Health Industry

Technologically, India is now self-sufficient in meeting the needs of hardware, software, connectivity and services. The prominent industries providing hardware and software supports are C-DAC; The Apollo Telemedicine Network Foundation in Hyderabad; The Online Telemedicine Research Institute in Ahmedabad; Televital India in Bangalore; Vepro India in Chennai; Prognosys Medical Systems Pvt. Ltd. in Bangalore; Medisoft Telemedicine Pvt. Ltd in Ahmedabad; Idiagnosis Technologies in Ahmedabad; and Karishma Software Ltd. in New Delhi. Many sturdy, standard HIMS solutions have been developed by the major IT companies such as C-DAC, Wipro GE Healthcare, Tata Consultancy Services (TCS), Amrita HIS Solution, Sobha Renaissance, and Siemens Information Systems Ltd (SISL).

1.7.9 Research and Development

DIT Initiative:

DIT, along with its societies such as CDAC and Media Lab Asia and in collaboration with many premier medical and technical institutions such as SGPGIMS, AIIMS, PGIMER and IITs, is involved in research, design, development and deployment of advanced telemedicine products and solutions. They also specialize in embedded and VLSI technology and biomedical, electronics, telemedicine and entrepreneurship development. C-DAC's Sushrut, a hospital information system (HIS) has been designed, developed and deployed at SGPGIMS[1]. It has also developed the institution-based application oriented telemedicine software systems Mercury® and Sanjeevani® and validated them at three premier medical institutions: SGPGIMS in Lucknow; AIIMS in New Delhi and PGIMER in Chandigarh. This it has accomplished using ISDN and satellite connectivity. It is also developed web version of Sanjeevani (e-Sanjeevani)[22].

SGPGIMS Initiative:

In collaboration with its technical partner, SGPGIMS developed and validated several application modules in telemedicine in addition to developing the prototypes Tele-ambulance for emergency health care, Mobile Tele-hospital for rural health care, and the portable suitcase telemedicine module for disaster situations.

Research publications:

India has contributed several research publications in peer reviewed scientific journals and book chapters in related field. A compendium of these publications can be found at: http://www.telemedindia.org.

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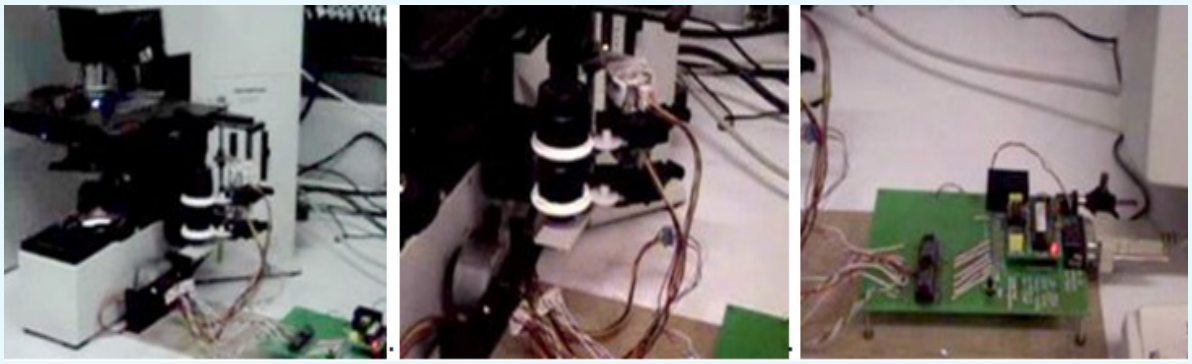
1.8 Indonesia

1.8.1 Case 1: Development of A Low-Cost Automatic Field-of-View Scanning Microscope for Early Tuberculosis Detection Systems

[8]We developed a TB automatic detection system using commodity components. The system consists of an electro-mechanical digital microscope to record the FoV images of sputum samples, image processing software to detect and to count the number of the bacteria in the FoV, and a decision system to determine whether the patient is diagnosed as a positive TB or not.

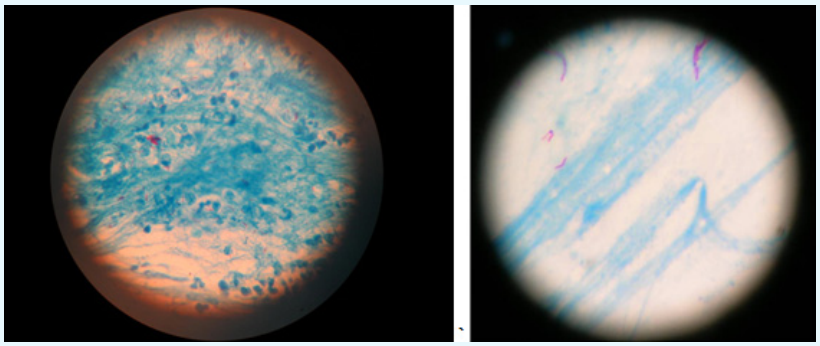
[8] Contribution: Andriyan Bayu Suksmono and Tati LR Mengko, School of Electrical Engineering and Informatics, Institut Teknologi Bandung, Indonesia. See document RGQ14.3.2-INF-0007

Figure 1: The modified optical microscope that is capable of performing automatic FoV scanning.



The electromechanical digital microscope is actually a modified one from an ordinary low-cost optical microscope. We add a two-degree-of-freedom scanner made of two stepper-motors and a digital camera fixed in front of the microscope's ocular. Figure 1 shows the modified-microscope, placement of the stepper motors, and the driver card with a simple microcontroller.

Figure 2: Two FoVs images of a sputum sample showing TB bacteria and its background



The image processing software and the decision system is now under-development. **Figure 2** shows two different FoV of the sputum microscopic images. The staining of the samples shows contrast of the TB bacteria with its background. The image processing software should be capable of separating the bacteria from the background. Then, the segmentation and counting process can be conducted.

Conclusions and further directions

We have described a low-cost automatic FoV scanning Microscope for early TB detection systems. Some parts of the system, i.e., the FoV automatic digital microscope, have been constructed. Our next steps are to complete the prototype with processing software, performing laboratory- and field- tests, and benchmarking with manual sputum analysis.

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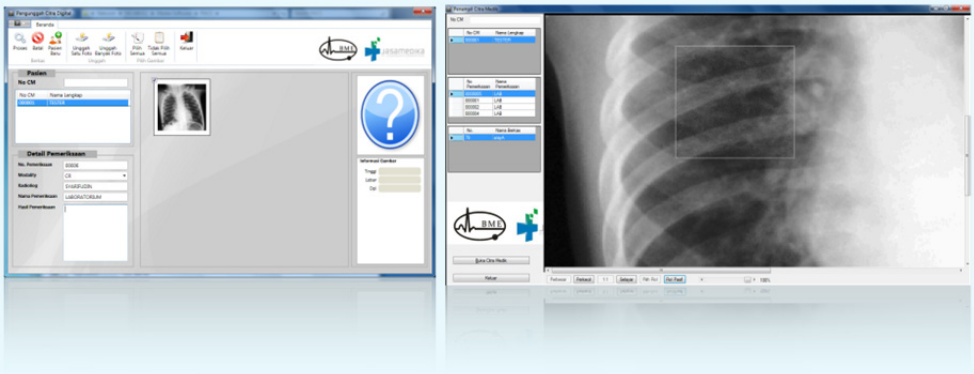
1.8.2 Case 2: Picture Archiving and Communication System (PACS) and Teleradiology Development and Implementation

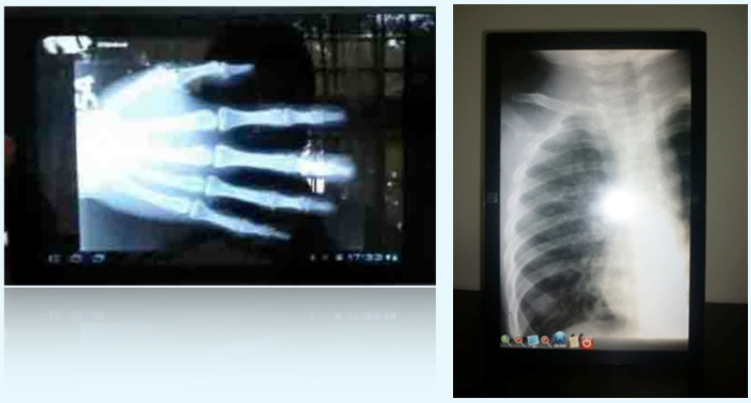
[9]Medical image becomes one of the most valuable assets in medical history and in supporting diagnosis process. Archiving and transferring medical image over telecommunication network is challenging, because of its size. It needs huge storage capacity to archive medical image in a health institution such as hospital. Our research since 2001 came out with effective compression method to compress the medical image in 16:1 ratio, yet maintaining the quality of image reconstruction over certain region of interest.

Figure 3: (Left) Application to manage medical image (right) Desktop Viewer



[9] Contribution: Utoro Sastrokusumo, Andriyan Bayu Suksmono, Antonius Darma Setiawan Bandung Institute of Technology, Indonesia. See document RGQ14.3.2-C-0007

Figure 4: (Left) PACS viewer on Tablet PC (Right) PACS Viewer using large LCD touch screen

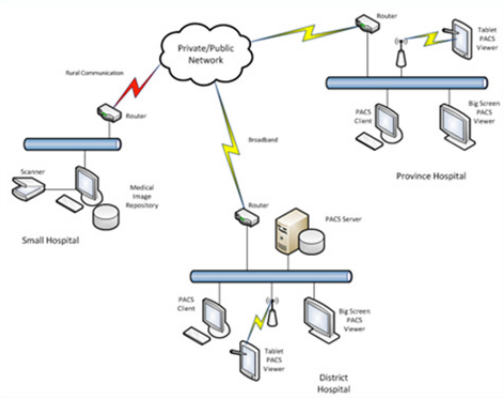


Our developed compression method was iterated for several years to meet the requirement from radiolog expert. We named our compression method as Scalable Fuzzy Vector Quantization (SFVQ). In the year of 2011, biomedical engineering of Institute Technology of Bandung cooperated with private company which works on health care area to develop commercial PACS. At the end of that year the beta version of commercial PACS product was launched. The product was implemented at to hospital, Agam General Hospital in West Sumatera and Cililin General Hospital in West Java. The product was design in a very simple user, yet powerful enough. However, there are many rooms for improvement.

The PACS product consists of three major components. The first one is the application to manage all medical images inside PACS. The second one is the application server to manage the interaction between client and storage server or persistence server. The last one is image viewer. We developed three kind of viewer, which are desktop, large LCD touch screen, and tablet PC.

We also develop on the PACS enhancement based on requirement and actual need. There is a need to have teleradiology session between small hospital which lack of radiolog and large computer where there are expert on medical image. Based on this need we expand the capability of our previous product into teleradiology supported PACS.

Figure 5: Teleradiology capability added into PACS



1.9 Kyrgyz Republic - E-Health Introduction in the Kyrgyz Republic - Experience and Further Steps

1.9.1 Introduction

[10]Since its independence in 1991, Kyrgyzstan has seen periods of democratic progress and of authoritarian backlash. With the fleeing of two presidents (in 2005 and 2010) after popular uprisings against authoritarianism, corruption and human rights violations; coupled with regional disparities and the repercussions of the inter-ethnic violence of June 2010, the country is going through a difficult process of transformation. In June 2010 several serious inter-ethnic confrontations took place in the south of the country. About 420 people died and 2,000 were injured, while over 2,000 houses and 300 businesses were destroyed. As result of June 2010 referendum a new constitution has been adopted. The new Constitution defines the Kyrgyz Republic as a parliamentary republic (during the previous 18 years, the country was a presidential republic) thus making it the only country with a parliamentary system in Central Asia. Parliamentary elections held in October 2010 were contested by 29 parties, with five winning places in Parliament and three forming a new coalition Government. Presidential elections held in October 2011 resulted in peaceful transfer of power. However, peace and social cohesion cannot be taken for granted, as the root causes of conflict, including inter-ethnic mistrust and regional tensions, eroded credibility of state institutions, social exclusion and uneven access to economic opportunities remain to be addressed. Kyrgyzstan in the past has seen concentration of powers around the presidency, with state institutions not perceived to be efficient, transparent or accountable. There is still work to be done to support the Government to strengthen the rule of law, address justice issues, reduce the prevalence of human rights violations, improve redress mechanisms and increase the independence and capacity of the judiciary, media (both public service and independent), the civil service and local government. Civil society's impact on decision-making still remains limited although its role has recently increased.

Kyrgyzstan has a GDP per capita of US$2200 (2010) and is classified as one of two low-income countries in the Europe and CIS region. The economy grew 3.9% per annum in 2000–2005 and 3.7% in 2005–2010. In 2011 the economy grew 5.7%. Poverty fell from over 62% in 2000 to 32% in 2009, but after the 2010 events it rose back to 33.7% that year, with an increasing proportion of the poor being female. Foreign debt is $2.803 billion as 2011, about 47% of GDP, while the budget deficit for 2012 is planned to

[10] Contribution: Chynara Suiumbaeva, ICTD component coordinator, Democratic Governance Programme, UNDP Kyrgyzstan. See document SG02-C-0202

be about 5.7% of GDP. There is a large informal sector, particularly in services and agriculture. Meanwhile, 26% of households have at least one member working abroad. Remittances had risen to US$1.7 billion by 2011, slightly over 30% of GDP.

With a human development index ranking of 126 out of 187, the Kyrgyz Republic is in the lower half of the medium human development countries. It raises seventeen places in the inequality-adjusted human development index. The country is 66 of 146 countries in UNDP's gender inequality index. The country's 2010 MDG report indicates that the country is unlikely to meet the MDGs for child and maternal mortality, tuberculosis, sanitation, and gender equality, although it is on track on extreme poverty reduction, access to basic secondary education, and access to improved water sources.

Life expectancy is 73.5 years for women compared to 65.3 years for men, and female literacy is high 97.7% (in the 15-24 age group). But despite progressive legislation on gender issues, women remain vulnerable to rising unemployment, a weak social protection system, and increased influence of patriarchal traditions in social relationships. Gender inequality, social and financial discrimination, and the additional unpaid work carried out by women mean that nearly 70% of the poor are now female. The continuing high prevalence of bride kidnapping in rural Kyrgyzstan remains a serious concern, and nearly 83% of women suffer domestic violence. In the government formed after the October 2010 elections, there were no female cabinet ministers until a lone woman minister for social protection was appointed on 7 April 2011. In those 2010 elections, representation of women in parliament fell from 30%to 20.8%, while in local councils it is now only 12%.

About 32% of Kyrgyzstan's population is between 15 and 25 years of age. Young people do not have full access to education, employment, health care, family decision making, and entrepreneurship. With inadequate educational training and poor economic prospects, many young people turn to crime and drugs. Young women, especially in rural areas, are particularly vulnerable to gender-based violence.

The country has prepared a medium-term Country Development Strategy (2012–2014) in the context of a macroeconomic outlook that looks challenging, but with potential for directing the economy on sustainable development. The Strategy focuses on creating conditions for attracting foreign investment, reform of state regulation aimed at eliminating bureaucratic barriers and expanding economic freedom of business entities, as well as on launch and implementation of 40 national projects in the medium-term. All these fundamental factors will be crucial for long-term sustainable human development and achievement of the MDGs.

1.9.2 Situation Analysis in the Healthcare System of the Kyrgyz Republic

Heart diseases are one of the leading causes of death and a major cause of disability. The importance of cardiology service is emphasized by the fact that cardio-vascular problems account for 50,3% in 2011 (48.3% in 2010) of all death cases in the Kyrgyz Republic.

The second alarming issue is the level of maternal and child mortality.

Child (infant) mortality is the crucial characteristic of national health. The child mortality rate is 20,7 per 1,000 born alive in 2011 (22,8 in 2010) and the structure looks as follows: the main share belongs to perinatal period conditions (65,2% in 2011, 63,1% in 2010, 60.0 % in 2007 and 60.9% in 2006), respiratory apparatus' diseases - pneumonia (12,3% in 2011, 14,9% in 2010, 16.7% in 2007, 17.5% in 2006), inborn anomalies (12,3% in 2011, 12,6% in 2010, 11.3% in 2007 and 11.2% in 2006) and infectious and parasitic diseases (5,3% in 2011, 4,5% in 2010, 6.8% in 2007 and 5.7% in 2006).

The major causes of such deaths are wrong diagnostics and incorrect prescriptions. The registration of child deaths at home shows that children die during the first five years of life because the parents are unable to properly evaluate the health status and do not know how to help. During the recent years the ratio of child's hospitalization caused by pneumonia has been high and made 36% for children up to five years, being one of the main death causes for children under 14.

In the last few years the maternity mortality rate has increased and in 2011 it made 49,3 per 100 000 live births (50,6 in 2010, 62,5 in 2007, 53,0 in 2006 and 60,0 in 2005). The leading place in maternal mortality increase was taken by the Talas region -87,0 per 100 000 live births in 2010 (61,3 in 2009 and 38.5% in

2006), the Naryn region – 83,5 per 100 000 live births in 2010 (135,6 in 2009), the Issyk-Kul region – 70,4 per 100 000 live births in 2010 (72,0 in 2009), Osh region – 59,8 per 100 000 live births in 2010 (117,4 in 2009). Rural areas take the first place in terms of death cases among women (86.8%). The major cases of such deaths are wrong diagnostics.The maternity mortality structure shows that 75.0% of deaths happen during pregnancy and childbirth. The first place of the mortality rate is taken by haemorrhages – 52.2% (in 2007 – 34.4%), the second by hypertension disorders - 22.4% (in 2007 – 34.3%), septic complications account for 10.4% (7.8% in 2007).

Although the prevalence of HIV is still low, the country has registered sharp increases in the number of persons living with HIV, and suffers one of the fastest rates of increase of reported HIV infection in the world. As of end 2011, there were 3111 registered HIV cases in the country, although WHO estimates suggest the true figure may be two or three times higher. Children now make up 8% of HIV cases in the country, following an outbreak in hospitals in the south of the country in 2007 and mother to child transmission. Because of women's vulnerability to HIV, sexual violence, inequality in decision making on contraception and sexual life, and poor sex education, the number of females registered as living with HIV increased by 75 times between 2001 and 2011, compared to 17 times for males. Despite progressive legislation, implementation mechanisms are weak and people living with HIV face continuing stigmatization. At over 12 cases per 100,000 people, tuberculosis prevalence is also high and rated as an epidemic. Much of the tuberculosis is multi-drug resistant, and the disease is particularly prevalent in the penal system because of overcrowding, poor ventilation, malnourishment and inefficient treatment. Meanwhile, an increasing proportion of tuberculosis cases are being registered among women and children. The prevalence of malaria, although still low, is increasing, particularly in southern parts of the country.

1.9.3 Objectives and Strategies

During the implementation of the National programmes on the healthcare reforms in the Kyrgyz Republic: "Manas" (1996–2005) and "ManasTaalimi" (2006-2011) the legislative base for the new health care system in the Kyrgyz Republic were established. The following new laws were adopted by Kyrgyz Parliament: on " The unify payer in the healthcare finance system" (2003), " About healthcare organizations in the Kyrgyz Republic" (2004), "Health protection of the citizens of the Kyrgyz Republic" (2005), " Public health care in the Kyrgyz Republic" (2009), amendments to the laws on "About the main principles of the budgetary law in the Kyrgyz Republic" (2000), " Local self governance and local governance administration in the Kyrgyz Republic"(2000), "Medical insurance of the citizens of the Kyrgyz Republic" (2003).

Every year, starting from 2001 the Government of the Kyrgyz Republic approves the Governmental Programme on State social guarantee provisioning free, preferential and paid terms of the healthcare services depending on the citizen's social status and medical insurance conditions. From 2006 the health care reforms performs under the Sector Wide Approach (SWAP).

The current National Programme of the health care reform "Den Sooluk" for 2012–2016 is a logical continuation of the previous national programmes focused on the 4 programme's directions:

- Cardio-vascular diseases;
- Maternal and child health care;
- Tuberculoses;
- HIV/AID.

The special focus in this programme was taken on the deployment of the ICTs in healthcare system from the view of standardization of the medical information systems and development of the unified telecommunication infrastructure. The implementation of the e-health services recognized as one of the main priority and includes the creation of the national e-health network for e-learning and tele-consultations.

Kyrgyzstan, as a country with difficult mountainous terrain needs the e-Health services because people in remote and rural areas have inadequate access to medical aid and health care. They have to travel for many hours to reach the nearest hospital or clinic. But to be effective, e-Health requires appropriate regulatory, legal and policy frameworks in both the telecommunications and the health sectors. Some of the critical factors for success are proper project management and a coordinated approach following the clear vision, the building up and maintenance of adequate technological infrastructure, the commitment of trained end-users and ICT literate citizens, and the political will to achieve challenging but realistic e-health goals.

Currently, Kyrgyzstan does not have a specific national strategy on e-health, which would require the initiative of the Ministry of Health together with other relevant Government agencies and CSOs. With the support of UNDP in Kyrgyzstan, the project on e-health in one of the remote areas (Batken) was implemented. UNDP is further looking at nation-wide project which would provide policy support and technical assistance toThe Ministry of Health of the Kyrgyz Republic, envisaging the following components:

Component 1: Draft National e-Health (including m-Health) Strategy & Action Plan developed and submitted for approval to the Kyrgyz Government.

Country's e-Health strategy will be based on national health priorities, the available and potential resources, and the current e-health environment. The enabling environment for e-Health is fundamental to scaling up and sustaining ICT adoption in the health sector. It includes aspects such as governance, policy, legislation, standards and human resources. Within the Kyrgyz Republic's national context, where the first pilot e-health project was implemented in 2009-2010 (joint initiative of UNDP, MTC and MH). This project featured a small initiative, within limited time-line, where advantages of using ICTs were demonstrated, including innovative ICT applications (with elements of m-health). The project was not sustainable due to the lack of ownership, commitment and e-health skills. In addition, it had a narrowfocus on certain aspects of e-health, while the changes and overall approach in the health care system were required. A national plan for a country in this context will be focused on making the case for e-health, creating awareness and establishing a foundation for investment, workforce education and adoption of e-health in priority systems and services. Without a parallel focus on creating the enabling environment, innovations in ICT will stay isolated and have only a limited impact on health.

Mobile communications have arguably had a bigger impact on humankind in a shorter period of time than any other invention in human history. Mobiles are also contributing to social, economic and political transformation. According to new WB Report (2012) to human and economic development opportunities, around three-quarters of the world's inhabitants now have access to a mobile phone and the mobile communications. The number of mobile subscriptions in use worldwide has grown from 1 billion in 2000 to over 6 billion in 2012, of which nearly 5 billion in developing countries. In developing countries citizens are increasingly using mobile phones to create new livelihoods and enhance their lifestyles, while governments are using them to improve service delivery and citizen feedback mechanisms. Mobile communications can help provide health care services more quickly and cheaper in many cases, mainly by focusing on primary, preventive and self-empowered approaches to health care. M-Health encompasses any use of mobile technology to address care challenges such as access, quality, affordability, matching of resources and behavioral norms through the exchange of information. It is a dynamic field for innovative new services that move health care away from pure public service delivery toward seeing the patient as a consumer. The recent studies estimated that m-health reduces data collection costs by approximately 24 percent, costs of elderly care by 25 percent and maternal and perinatal mortality by 30 percent (Telenor Group 2012). The same study finds that m-health can improve compliance with tuberculosis treatment by 30-70 percent. Taking into account above, finally, M-health should be integrated with larger e-Health Strategy and Action plan.

Component 2: National Process for e-Health Standardizationinitiated, key technical standards developed/adopted and submitted for approval to the Kyrgyz Government.

Considering the rapid introduction of e-health worldwide and potential growth in Kyrgyz Republic it is necessary to initiate the development of generally acceptable the national standards and guidelines to

facilitate growth of e-health application in Kyrgyzstan. Enormous international efforts are being put in this direction to regulate/guide the growth of healthcare IT ecosystem. These efforts are the result of compelling need for the standardization of processes in which healthcare information is represented and transmitted from system to system. For any developing country to embark on proposing standards for e-health and Hospital Management Information Systems (HMIS) it is imperative to study the existing international standards. Many Standard Development Organizations (SDOs) and Special Interest Groups (Sigs) are active in standardization process for addressing the issues of sharing of health data, data structure, access management, standardizing clinical and business process in healthcare and security and privacy. Some of the key relevant standards such as ISO/TS 18308, CEN/TC 251 EN 13606, DICOM, HL7, CCR-ASTM, CEN/TC 251 EN 13940, ICD-10-PCS, SNOMED-CT, CPT, UNLS, ITU-T H.32x. For any developing country embarking on introducing standardization will benefit by going through the exercise of reviewing these available standards to see their suitability for adoption.

Component 3: National e-Health network (with national e-Health center/node) and mechanisms for rapid deployment of ICT-enabled public e-health services created and some public e-health services (on cardiovascular, maternal and prenatal healthcare) provided to the citizens of Naryn and Osh provinces of the Kyrgyz Republic.

Under this new project it is planned to create national e-health center (s)/node(s) equipped by different modern digital medical and telecommunication equipment, real-time management of medical records, broadband connection and adapted e-health software systems in national e-health center. Thesecondary and primary health centers in Naryn and Osh provinces of the Kyrgyz Republic to enable continuous medical education and tele-consultation will be also established. Webcasting of the interactive courses by leading medical professionals to university students and young professionals in remote areas will be provided as well. Tele-consultations using an integrated system capable of managing patients, storing and forwarding medical records and images and providing second opinion to remote patients will be held. The system will comply with international standards adopted and approved by Kyrgyz Government. Some e-health services in cardiovascular, maternal and prenatal areas will be operational for Naryn and Osh province's patients.

1.9.4 Activities Implemented

UNDP Kyrgyzstan jointly with the Ministry of Health and Ministry of Transport and Communications of KR has successfully piloted in 2009-2010 the first e-health project in the Kyrgyz Republic in the remotest region of the country - Batken province, which lacked medical personnel, health services and special medical equipment. Two leading national medical institutions participated in this first e-health project. Medical receiving stations installed in these institutions and remote equipment for transferring the medical data wereprovided to the regional hospital. 24/7/365 help was arranged at the national centers with high professional medical staff in order to provide ON-OFF medical support with diagnostics and prescriptions. Different types of telecommunication and special medical equipment installed to ensure high quality communication of all necessary medical information to the both ends. Local population had access to health services at their place of residence.

The main objective of the project was to create and implement the first interactive E-Health services in the Kyrgyz Republic in order to decrease the mortality rate, especially on cardiovascular and maternity & child healthcare andto promote effective use of ICT as a powerful instrument for governance, economic and social development, citizen's access to public information and government services. E-Health services are considered as a component of the E-Government implementation in the social sector, which is an effective tool for improvement of health care service delivery through use of modern ICT technologies, especially in remote rural areas with focus on women and children and contributes to MDG 4 and 5 achievements.

1.9.5 Changes and Results Achieved

The project produced the following outputs:

- Access to public medical services was improved for populations in remote rural areas.

- Distance medical services for remotest region (tele-cardiology as well as maternity and child health care) were established.
- ICT possibilities in the healthcare area on provision of different medical services were demonstrated.
- Qualification of local medical personnel was improved through professional and IT-trainings.
- The project's idea and results were presented on round table with participating of the Vice-prime Minister of the Kyrgyz Republic and all interested stakeholders- Government entities, NGO's, mass media, universities and others. Very positive feedback received from all parties. Based on a result of this pilot project, the Ministry of Health of KR developed and submitted the document requesting budget from Government of sharing the best practice in order to implement the project's idea in all other regions of KR.
- The project was also presented at the SWAP meeting – regular biannual meetings of international donors, investing in healthcare sector of KR. It was the request from the Ministry of Healthof KR (from stats-secretary of the ministry) to mobilize additional resources for extension of the project to other regions of KR.
- The information about project was placed in DG TTF 2009 Annual report as best practice example (Democratic Governance Thematic Trust fund Stories from the field).

1.9.6 Lessons Learned

- The project's idea and suggested technological solutions are practical and can be easily replicated in other regions of the country and even more – in other countries with similar geographic and socio-economic conditions.
- State ownership: there was a high degree of commitment of key stakeholders during the project implementation. The Ministry of Health, despite the frequent changes of the departmental heads, remained interested in the project and expressed the intention to sustain project results. Middle managers were included as facilitators in the technical working group, have consistently advocated to the senior management the expansion ofthe interactive electronic medical services through the inclusion of this thematic area in the SWAP strategic objectives.
- Not all modern digital medical diagnostic equipment could transfer its data outside of the device using Bluetooth or USB ports and allow to connect to third party (not own) software.
- Lack of practical experience and knowledge on e-health not only in Kyrgyzstan and the Central Asia region.
- The lower level of preparedness and competences of the local medical personnel to use the computer and modern medical diagnostic equipment.
- Latent resistance (or skepticism) from doctors (rural and central) to accept new way of providing medical services.
- Lack of involvement of NGOs in the project activities. The project document envisaged NGO stakeholders in the steering committee, which however were not able to provide necessary contribution.
- Prior to the project commencement, there was no proper stakeholder and institutional analysis made. This impacted project implementation results.
- Strategies for engagement and cooperation of donors in this area need to be developed and the Government should play a central role in coordination and facilitation of this process.

1.10 Laos: E-Health Activities by Fujitsu, JTEC and Laos Government

1.10.1 Project Information and Background

[11]In Lao P.D.R., the Ministry of Health, headed by the Minister, has the strong intention to utilize ICT in the health and medical fields, and the "ICT Master Plan (ver.1) for MOH" was established in October 2008.

The e-Government Network, led by the National Authority for Science and Technology, which is to be commonly utilized by all the government ministries and agencies, is put into operation mainly in Vientiane capital and under expansion to provincial capitals.

For the Ministry of Health, it is vital to introduce e-health applications in an effective and efficient manner to realize the aforementioned ICT Master Plan by utilizing the ICT infrastructure in e-Government Network.

Thus, in order to effectively promote the ICT application in the health and medical fields, the collaborative research team of Japan and Lao P.D.R. has conducted the study on the scheme and methodology of "How to develop, maintain, and utilize the comprehensible e-health contents" under the support of APT

(EBC-J2) scheme – 2008.

1.10.2 Summary and Purpose of this System

The results of the collaborative research are fruitful and there are high interests and demands for the realization. Therefore, as the practical and sustainable way forward, the pilot project under the support of APT (EBC-J3) scheme – 2009 has been implemented with the purposes of:

1. Establishment of ICT Access Points for proper information provision to the public (especially health and medical information) by expanding the existing e-Government Network.
2. Deployment of the ICT facilities available for (but not limited to):
   - Remote consultation between Central Hospital and Provincial Hospital.
   - e-Education for doctors, nurses, and other medical staff.
3. It is highly expected the pilot project would be:
   - the best practices of ICT based improvement for health and medical field;
   - the best practice of effective utilization of e-Government network;
   - paving the way for the Network expansion into rural areas.

- **Network overview**

As shown in Figure 6Error! Reference source not found., the dot line area shows the part installed in the pilot project. Main part is the IP Microwave Radio System to provide connection for Luangphabang Provincial Hospital in order to connect to the e-Government Network led by the National Authority for Science and Technology. The two hospitals in the map placed at the bottom right of Figure 6 are connected through the e-Government Network.

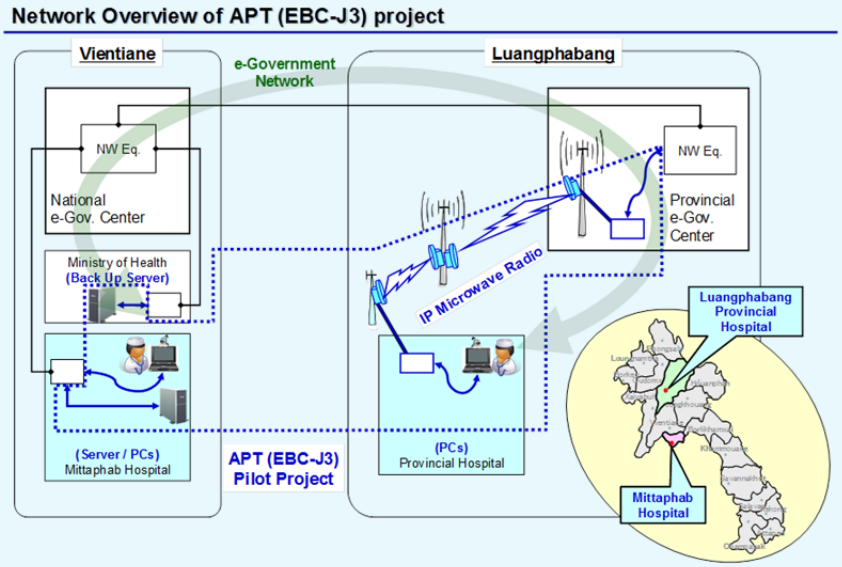
- **System overview**

Figure 7 shows the system overview of the pilot project. In Mittaphab Hospital, Main Server for Web Video Conference System and File Server, and 2 client PCs are installed. Back-up Server for secured

[11] Contribution: Go Maeno, FUJITSU LIMITED, Japan. See document RGQ14.3.2-INF-0019

system operation is located in Ministry of Health headquarters. In Luangphabang Provincial Hospital, 2 client PCs and 1 PC for Open ICT Access Point are installed.

Figure 6: Network overview of the pilot project



For Remote Consultation between doctors, the Web Video Conference System is used for the more understandable communication. Also, document files such as Consultation Reports can be shared through the File Server.

For e-Education, the contents stored in the File Server can be accessed remotely. In addition, the recording function of the Web Video Conference System is quite useful. For example, seminars can be recorded in synchronization with the slide show and explanation for them.

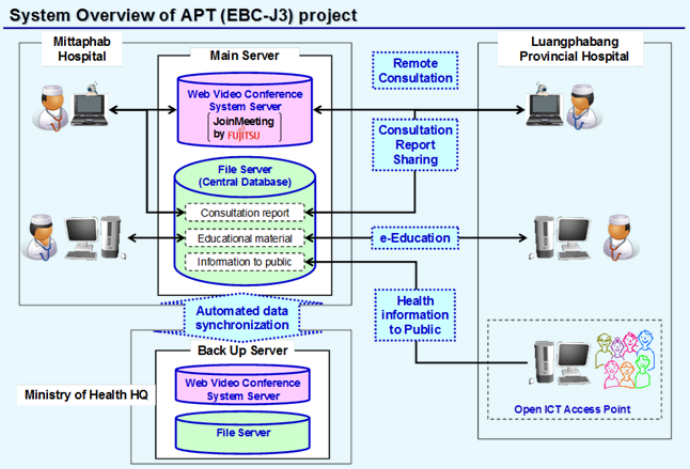
Public who visit the hospital can access health information easily from the ICT Access Point located at the lobby in Luangphabang Provincial Hospital. In addition, automated data synchronization is activated between Main and Back-up Servers. In case of server trouble, system availability can be kept by switching the connection to the Back-up Server.

1.10.3 Major Implemented Items

Major implemented items under the pilot project:

- IP Microwave Radio System has been installed to expand the e-Government Network to the Provincial Hospital.
- Central Database has been assembled for compiling medical contents database, including back-up system.
- Web Video Conference System has been installed.
- Open ICT Access Point to the public has been established in the Provincial Hospital.

Figure 7: System overview of APT (EBC-J3) project



With the system installed, the ICT environment for project sites was improved.

1.10.4 Effectiveness

As a result, we have ready conditions for more understandable communication for Remote Consultation, compensation for the insufficiency of practical training, and provision of proper information to the public with full system installation and continuous utilization. Our aim “improvement of health and medical environment with ICT for rural areas” has just been achieved as the pilot case in Lao P.D.R.

1.10.5 Conclusion

Starting from the establishment of the ICT Master Plan for Ministry of Health, our 3-year continuous activities on the pilot project have come to a conclusion. However, the conclusion of the pilot project is not the goal, and we have the strong intention to step forward to the practical deployment of ICT in health. The system installed reflects the real need to fill the gaps between demands and the actual situation. Thus, the success of the pilot project would be paving the way for the expansion to other provinces and the establishment of nationwide networks of e-health.

As the next step, we will make a comprehensive review on the concluded activities to ensure Roadmap & Action Plan for Practical Implementation, Practical solutions for the identified issues, [Namely, more practical work than theoretical]; Skilled personnel for sustainable enhancement.

These are indispensable for the practical deployment of ICT in health. Therefore, we are applying for the APT (EBC-J2) 2010 program and will keep our close relationship with the current project member organizations. Also, we have set our sights on best practice sharing with other sectors in Lao P.D.R. and with other countries.

Our further target is to formulate the practical project for ICT enhancement in not only Lao P.D.R. but also other developing countries.

1.11 Lebanon: E-Health in Lebanon – Where Do We Stand?

1.11.1 Introduction

[12]This document is based on a recent report that was the outcome of a project funded by the World Health Organization (WHO) in Lebanon for developing a national e-health plan. The purpose of the project was to illustrate the current e-health status in Lebanon. The areas assessed were the existing and planned e-health applications and services, the available/potential information communication technology (ICT) infrastructure for e-health, the human resource capacity, standards and interoperability, e-health strategy and investment, e-health legislation, policy and compliance, and Governance. The assessment is used to establish near term opportunities for e-health projects, and to explore possible actions to be undertaken in developing a comprehensive national e-health implementation strategy for Lebanon in the near future.

1.11.2 Country Overview

In Lebanon the economic, social and political forces have been exponentially influencing the healthcare sector for a number of years, hindering the implementation of any new heath model or strategy. So far in Lebanon e-health is suffering from a low profile even though e-health has increasingly large impact on healthcare. There is a lag in uptake of e-health because the field needs more professionally trained staff on board. The social environment is having an undeniable influence on consumers; there is still a portion of the Lebanese community who are not yet accustomed to the use of Internet-mediated electronic means for the provision and management of health services. Moreover, the preference of face to face meetings for assessment, treatment and consultation may negatively influence the development and implementation of e-health technologies and applications.

Promoting the use of information technologies in healthcare is one of the defined priorities in e-health implementation. Article 5 of the Telecommunications Law 431/2002 specifies that among the duties of the Telecommunications Regulatory Authority (TRA) is “to assist educational and health care institutions in the implementation of their programs by the use of Telecommunications Services, and to facilitate the access of disabled persons to Telecommunications Services.”

As for the use of standards, there are no e-health standards/policies/standardization being implemented at health institutions that make the physicians comply with e-health practices. The lack of standards influences the deployment of e-health practices on a large scale and creates gaps that hinder the benefits from using ICT, mainly its potential in improving care and sustaining cost. In addition, the lack of metrics for measuring successful deployment of e-health are also hindering improvement.

The Ministry of Public Health (MOPH) in Lebanon is concerned with the public health issue more than the e-health per se. According to the General Director, since there are no geographical barriers or lack of specialized doctors in the country, telemedicine is not a target at this point so far. The priority for the MOPH is to have better managed care, better epidemiological reporting, e-billing, and e-pharmacy.

Currently there is no national policy in the country that commits healthcare institutions or clinics to implement Electronic Health Records (HER). Furthermore, the existing e-health applications in health institutions lack the interoperability with the MOPH’s health information systems. In this regard the institutions are not having the full benefits behind the deployment of e-health applications. As for monitoring activities, innovative systems and services for monitoring the health status of people at risk or those suffering from any chronic illness including those associated with ageing, wearable, portable or implantable systems are used. These systems can offer the means to follow patients’ health outside the health institutions. However, very few institutions are able to manage diseases and develop early diagnosis of symptoms from a distance. As for ICT infrastructure, the deployment of a proper ICT infrastructure that demonstrates the benefits of e-health services on a larger scale in the country does not

[12] Soha Saifeddine, Telecommunications Regulatory Authority, Lebanon. See document SG02-C-0210

exist so far. So far the ICT infrastructure has been implemented within some health institutions at various levels to communicate data across the same institution and never across other institutions. In addition, the required ICT infrastructure to create a database for patients' records in health institutions is not up to the level for e-health practice and therefore needs further development.

1.11.3 Activities Implemented

The key trends and developments in the e-health domain in Lebanon, aiming at improving the quality of healthcare, can be classified into the following categories:

- **Physiological monitoring activities**

Physiological monitoring activities are the most used e-health applications in Lebanon. Medical institutions use various systems for monitoring activities such as screens connected to cameras and other monitoring apparatus for inpatients only.

The Ministry of Public Health has implemented the monitoring systems for medications and vaccines distribution and storage. The system allows identification of the medication or vaccine expiry date five days in advance. Also the system will notify about temperature change in the storage media via alert systems connected to the mobile device of the manger. That system was implemented in 2006 in collaboration with the WHO.

The availability of body area networks (BAN) and e-health applications will allow the practice of vital sign tele-monitoring of chronically ill outpatients. Such type of monitoring is not available in Lebanon, very few hospitals provide only cardiac tele-monitoring with the use of holter.

- **Diagnostic evaluations**

The use of diagnostic evaluation tools is limited to the laboratories and radiology departments such as (MRI, PET scan, CT-scan etc…).

An example of a successful development is the Lebanese Ministry of Public Health (MOPH) Mobile Applications.

1.11.4 Lebanese Ministry of Public Health (MOPH) Mobile Applications

The mission of the Lebanese Ministry of Public Health is to improve the health status of the population by ensuring an equitable accessibility to high quality health services through a fairly financed universal coverage.

MOPH' main goal is to protect the population' health through the legislation and development of health promotion and preventive programs, to contribute to the social safety net, eradicate and control the communicable and non-communicable diseases prevalent in Lebanon.

In order to reach these mission and goals, the MOPH launched a unique, one of a kind Mobile app and the first in the Lebanese public sector; aiming to facilitate the cooperation with other ministries, private sectors and the civil Society.

The main objectives of the App are:

1. To develop the health sector and to improve the quality of health care delivery through the use of information and communication technology.
2. To increase transparency through the dissemination of health-related information.
3. To facilitate access to services delivered by using the best and fastest possible electronic means.
4. To increase the accountability through the adoption of a mechanism for complaints.
5. To ensure equity in services' availability and utilization.

Main Functionalities:

Users have direct access to the Drugs Public Price List; they can check their availability, price and legalization in the Lebanese pharmacies. They may as well locate the nearest public hospitals, private hospitals and medical centers, check their full address & call directly from the app.

Users may as well benefit from health info and learn about healthy life-styles and food habits. People and communities can now seek greater and effective participation in the planning, implementation and evaluation of primary health care and public health programs; and report fraudulent actions directly to the Ministry of health through the app. All app users will receive alerts on news, drugs recalls, laws etc. from the ministry.

Main Features:

- Drugs list (check price, dosage, form, legalization ...).
- Rules and Guidelines concerning MOPH disbursed expensive drugs and chronic diseases drugs.
- Public/Private Hospitals and Primary Health Care Centers Directory.
- Ministry of Health services and campaigns.
- Report fraudulent actions directly to the Ministry of Health.
- Healthy tips on lifestyles and habits.
- Push notification.
- Media Gallery (Ministry Activities & events).

About MOPH: Latest News, MOPH Portal, Locate us, MOPH Directory, call center (1214)… MOPH is available for free to download in the iTunes Store and Android Google Play App Store.

Figure 8: MOPH is available for free to download in the iTunes Store and Android Google Play App Store

Clinical decision support system

Clinical computerized decision support systems (CDSSs) which are meant to help address the problems of variable quality and safety in health care, are available in some institutions but mainly limited to laboratory findings and very few to medication administration. The available systems allow comparison between normal and abnormal laboratory findings only upon highlighting the abnormal level in order to grab the attention of healthcare providers.

Storage and dissemination of healthcare data

The first step towards e-health is to create the backbone- the electronic health record (EHR). The EHR will ultimately link all patient information from across the health care system, hospitals, private clinics, pharmacies, and elsewhere healthcare is being provided to individuals.

In some health institutions in Lebanon, patients' health records are being scanned and then stored in digital form as image files. Then patients' records are stored under their ID numbers per hospital visit and listed by date.

Image compression for efficient storage and retrieval: Picture Archiving and Communication Systems (PACS)

The use of Picture Archiving and Communication Systems (PACS) can improve diagnostic radiology. PACS's main purpose is to replace hard film copies with digital images that can be used and seen by several different medical professionals simultaneously.The use of PACS is being practiced at a number of health institutions in Lebanon.

Research:

- Research on e-health practice:

Research on e-health practice can contribute to the overall understanding of the e-health domain and its impact on quality care. Very few health institutions in Lebanon are currently practicing research on e-health.

- Clinical research:

The practice of clinical research can contribute to the overall understanding of the health system in the country and how it is changing. In order to carry out this work, a large amount of aggregate clinical data on the health system is needed. The competencies available to supply this data include data aggregation, data communication and statistical analysis.

In Lebanon, a small number of health institutions practice clinical research in their institutions. As a matter of fact, research needs improvement as the access to clinical data is restricted to administrators and very few clinicians. Furthermore, Health data are being stored as image files which limits data processing and impedes search by computer engines, and therefore creates a barrier to clinical research.

Computerized provider order entry and e-Prescription

Very few health institutions in Lebanon are using Computerized Provider Order Entry (CPOE), a computer system that allows for the direct entry of medical orders by healthcare providers. The CPOE system enables physicians/healthcare providers to check medication and health procedure orders for incorrect drugs, doses, and routes of administration, as well as for any allergies and drug interactions. If the computer system detects any of these problems, an alert is generated to make the provider aware of the issue. The primary goal of CPOE is to reduce medication errors, and enhance communication among healthcare providers to increase patient safety.

As for e-prescription, it is not a trend so far in Lebanon. Most of the health institutions do not have the CPOE or the electronic prescriptions launched yet. Very few institutions practice electronic prescriptions for restricted antibiotics only. Therefore, all health institutions are still using the traditional paper medical chart. For some institutions that are having difficulties with regards to archiving space, they resolved this problem by scanning the patients' charts and storing them as digital images.

Voice recognition for dictation

Voice recognition for dictation is not available at any health institution in Lebanon. What is being practiced in few hospitals is that the doctor records his/her medical report on a tape recorder and then the report is typed by a clerk and filled electronically.

Use of Streaming media in health care institutions

The continuing education of healthcare providers is required for better practice, whereas education of healthcare consumers is necessary for health promotion and better management of patient's own health. Very few health institutions in Lebanon use streaming media such as video sessions, power point

presentations, e-pamphlets for educational purposes to both healthcare providers and consumers. Some institutions have made the educational material accessible from their websites to promote access. The use of streaming media has eased the dissemination of the educational material; also it helped in managing the continuing education (CE) credits for healthcare providers.

Ministry of Public Health's (MOPH) initiatives to promote and support e-health practices

- **TWFS (Transactions and Workflow System):**

The objective of this system is to automate the workflow, track and monitor the transactions and documents involved in the procedures of the Ministry of Public Health's administrative units.

The system is expected to provide user-friendly, secure and reliable methods of performing and tracking all the processes and procedures along with the associated forms utilizing a flexible, quick and easy to use tracking, monitoring and reporting mechanisms that will empower the MOPH administration in performing its duties and functions with minimal effort, high efficiency and productivity. It will also relieve citizens from the burden of administrative procedures and provide them with a better and faster service.

The system allows visitors to the MOPH's website to benefit from the below services:

Administrative Services:

- Search for a specific service through the organizational structure of the ministry.
- Have access to all details related to the service required: the unit responsible of this service, the head of unit, the required documents, the conditions, the fees, the duration of the procedure, working days …
- Download a pdf application form or fill an interactive pdf application.
- Submit on-line transactions with attached documents.
- Login to the website using a Document ID and a Password in order to track and retrieve all the information related to the status of the transaction, and send any comments about this transaction to the related department

Drugs:

- Download the complete list of drugs with their public prices based on foreign currency rates and according to Resolution 51/1 issued in 2006.
- Search for drugs using different criteria: Drug's name/Laboratory/Agent/Country of origin.
- Search for drugs that have been recalled from the Lebanese market.
- View the list of registered drugs according to INN classification (First draft): Ongoing project.
- Check the Lebanese National Drug Index which is a simple verified listing and classification of available products in the Lebanese market.
- View all the information related to the Drugs technical committee including meeting schedules & agendas, the list of applications submitted for Drugs Registration, the Resolutions taken by the committee regarding the registration of medicines @MOPH…
- An instant notification e-mail is always sent to concerned parties when publishing any new information related to Drugs.

Doctors Fees:

Physicians who are treating patients on the expenses of MOPH can login to the website using their credentials to access all details related to their payments from MOPH using an advanced tool for searching and reporting .

- **Decentralization Systems: District Health Information System:**

This is a tool to monitor diseases and their spread over different areas allowing the ministry's officials to plan for intervention and activities in an appropriate and timely manner.

- **Visa System: This system started on May 19, 2003 at the MOPH's visa center. It:**
  - Allows 25 regional visa centers to connect remotely to the MOPH's database using web technology and to MOPH's users through LAN technology.
  - Creates a unified patient medical file, independent of the treatment place and visa issuing center.
  - Allows the MOPH to view the history of every patient's file.
  - Automatically rejects patients who benefit from other public funds (Army, ISF, NSSF, CSC).
  - Creates a unified applicant's file to control the frequency of the requests submitted per applicant.
  - Retrieves accurate statistics to help managers to take appropriate decisions.
- **Billing System:**
  - Allows contracted hospitals to connect remotely to the MOPH's database using web technology.
  - Bills are entered by each hospital.
  - Provides information about bed occupancy status by hospital: the allowed number of beds/day v/s the occupied number of beds.
  - Used as a tool for quality control.
  - Provides admission diagnosis v/s discharge diagnosis, diagnosis v/s procedures etc… .
- **Interconnecting System:**

This system allows the MOPH and other public funds, namely the Army, the Internal Security Forces (ISF), the National Social Security Fund(NSSF) and the Civil Servants Cooperative (CSC), to share information about eligibility in order to avoid eligibility overlapping and double coverage. The main functionalities of the system are:

- Building a database (@MOPH) for beneficiaries in different public funds (Army, ISF, NSSF & CSC) containing demographic & eligibility information.
- Providing electronic linking of the beneficiaries databases in different public funds to the MOPH Interconnecting database.
- Performing a daily update of the Interconnecting database by establishing an automatic connection with public funds and downloading files containing updated beneficiaries information.
- Giving the public funds remote access to the centralized MOPH database for searching purposes.
- Is integrated with the Visa/Billing systems.

- **Human Resources for Health – HRH:**

The HRH system manages personal and professional data for human resources working in the health sector in Lebanon. Through this system, the MOPH now owns a database including personal and professional data for all health professionals in Lebanon except for specialized physicians and Dentists.

1.11.5 Challenges, Main Barriers and Difficulties for the Development of E-health in Lebanon

- Governmental Barriers:
  - Lack of national plan for the e-health practice in Lebanon.
  - Absence of e-health policy and standards.
  - The health sector is influenced by many underlying factors in the country, such as political instability, privatization control, and political power.
- Institutional Barriers:
  - The high cost of technology that most of the institutions cannot afford in the lack of funding resources (such as the absence of external financial support), in addition to budgetary constraints.
  - Reluctance to change from the traditional health practice to e-health practice.
  - Lack of qualified e-health professionals and training in the use of new technologies.
  - Lack of collaboration between the private and governmental healthcare organizations/institutions.
  - Lack of leadership and expertise for e-health practice (policy makers, managers).
  - Lack of interoperability in e-health practice.
  - Lack of collaboration among public and private institutions in the health secto.r
  - Lack of awareness about e-health benefits in healthcare practice.
  - The need to update the administrative and organizational structures of existing health institutions.
  - Lack of health information websites.
- Socio-cultural Barriers:
  - Patients' preference of the face to face meeting and interaction with the healthcare provider.
  - Lack of patients' awareness about the benefits of e-health practice.
  - Lack of computer literacy among some patients mainly older patients.
  - Poor internet or lack of internet access especially in villages and remote areas.
  - Fear of e-health failure in a politically unstable country.
  - Electronic signature is not legalized yet by the government.
  - Complexity of the Social Security System dealing with public health insurance.

1.11.6 Lessons Learned, Next Steps and Recommendations

Efficiency in healthcare provision, provision of quality care, reaching the underserved population, and minimizing medical errors are the main driving forces to the implementation of e-health in the country. E-health practice will improve patient safety, reduce healthcare cost, allow better healthcare

management, allow better disease management, and solve the problem of shortages of healthcare providers in Lebanon.

The priorities to for successful e-health implementation are:

- National/Government level:

Compose a National e-health policies and strategies Committee in Lebanon. This committee will be in charge of:

  - Establishing a 5-year e-health strategy plan to advance the use of information technology all over the health sector.
  - Dealing with the local e-health strategic planning including infrastructure, funding, policy and governance of e-health practice, besides collaborating with International e-health foundations.
  - Developing e-health competency framework to guide and help ensuring sufficient skills for various healthcare professionals, who should be also adequately prepared to train other healthcare providers.
  - Establishing a national forum that:
    - Promotes the use of telecommunications and related technology in the delivery of health care and health education in the country.
    - Facilitates and assists various healthcare organizations in developing secure and private electronic health records for the Lebanese citizens and makes health information available electronically whenever and wherever it is needed.
    - Serves as a forum for advocacy, communication and sharing of resources among communities of interest.
  - Raising awareness among the various stakeholders about the opportunities in the e-health sector in Lebanon.
  - Assisting healthcare facilities in securing the needed funds for e-health implementation from national and international resources.
  - Considering innovative financing and compensation schemes for e-health services.
  - Including e-health concepts in medical and nursing curricula.
  - Legalizing electronic signature and making it lawful by the Lebanese government in order to encourage healthcare institutions and insurance companies to promote e-health practices and data protection and liability through the development of guidelines and codes of conduct for e-health services.
  - Putting more emphasis on international cooperation in order to promote benchmarking and evaluation projects that can provide evidence to support the deployment of e-health practices.

- Ministry of Public Health Level:
  - Initiating the Electronic Health Record (EHR) system and facilitate the communication of health data between the private and public health sectors.
  - Encourage national research in e-health practices.
  - Collaborate with healthcare industry organizations such as the Health Information Management Systems Society (HIMSS).
  - Collaborate with professional communities such as the American Health Information Management Association (AHIMA).

- Establish standard national educational programs towards preparing qualified healthcare providers who are proficient in e-health practices.
- Establish standards for e-health practices while benchmarking with international standards.
- Establish a Pharmacies Network for E-prescription.
- Encourage collaboration between private and public/government healthcare organizations.

- Healthcare Facilities Level:
  - Follow the national standards, which should be developed by the MOPH.
  - Maintain confidentiality and security of electronic health data.
  - Facilitate proper access to patient records for authorized personnel.
  - Allow online access to lab and diagnostic results (X-rays, CT scans and MRIs) for patients and healthcare providers as needed.
  - Utilize the Pharmacies Network for better medication prescriptions.
  - Establish interoperability of e-health applications in health institutions with the MOPH's health information systems.

1.12 Mali: La cybersanté au Mali – des projets pilotes à une institutionalisation réussie: leçons apprises et perspectives de passage à échelle

1.12.1 Introduction

[13]Chaque année plus de dix millions d'enfants de moins de 5 ans meurent de maladies prévisibles telles que la pneumonie, la diarrhée et le paludisme. Un grand nombre de ces décès est dû à des causes indirectes entre autres les guerres et le VIH/SIDA. La malnutrition, le faible niveau d'hygiène, le manque d'eau potable et des soins sont incriminés dans près de la moitié des cas. Environs cinq cent milles femmes meurent pendant la grossesse, la plupart pendant l'accouchement ou dans la première semaine du postpartum.

Le Mali est l'un des pays ayant les taux mortalité infantile et maternel les plus élevés dans le monde soit respectivement 196 pour mille et 464 pour cent mille. Huit femmes meurent chaque jour des complications de la grossesse. Près d'une femme sur deux n'ont pas bénéficié de soins prénataux. Plus de 59 pour cent accouchent à la maison sans l'assistance d'accoucheuses qualifiées. Environ un enfant sur cinq meurt avant la célébration de son cinquième anniversaire. Les causes de décès des moins de cinq ans sont principalement les conditions néonatales (26%), la pneumonie (24%), la diarrhée (18%) et le paludisme (17%). Un enfant sur deux meurt de sous-alimentation et beaucoup sont malnutris.

L'accès aux soins essentiels n'est pas équitable au Mali et le taux de couverture sanitaire reste faible. Près de 8 décès sur dix des moins de cinq ans surviennent à domicile.

Selon les principales conclusions issues du Rapport de Suivi de la mise en œuvre des OMD au Mali 2010, il est invraisemblable que pour le pays d'atteindre les objectifs 4 et 5 du millénaire en 2015.

Pour combler son retard dans la mise en œuvre des OMD, le Gouvernement du Mali a élaboré le programme de l'Initiative d'accélération des OMD dans les 166 communes les plus vulnérables. Parmi les stratégies adoptées figure celle l'intégration des services essentiels pour la mère, les nouveau-nés et les moins de cinq ans au sein même de la communauté spécifiquement dans les zones éloignées et

[13] Contribution: Ousmane Ly, Agence Nationale de Télésanté et d'Informatique Médicale (ANTIM), Mali. See document SG02-C-0186

défavorisées proposée par l'UNICEF. Il s'agit d'une stratégie qui intègre à la fois les soins à domicile, le porte à porte, l'approche communautaire et les structures sanitaires.

Le défi est aujourd'hui est d'améliorer la réactivité du système de santé malien afin qu'il puisse assurer une équité et une accessibilité à tous aux services et soins de qualité spécifiquement aux femmes enceintes et aux enfants de moins de 5 ans.

Pour faire face à de défi, malgré la précarité des moyens, avec le plus souvent l'inaccessibilité géographique, l'insuffisance des infrastructures (routes, électricité), et la lenteur de la collecte de données (due au facteur temps, l'utilisation du papier, la lenteur de la remontée de l'information, etc.) il est important, voir indispensable de mettre en place une stratégie qui soutient un mécanisme permettant en temps réel:

- de suivre et d'évaluer les actions,
- d'apporter l'expertise pour la fourniture des services et soins de qualité,
- et d'assurer le renforcement des capacités des Ressources Humaines (RH) à distance.

L'une des solutions à portée des mains est l'utilisation des TIC appliquées à la santé: la Cybersanté.

Dans le but de promouvoir une utilisation judicieuse et efficiente des TIC dans le système de santé, l'Agence nationale de télésanté et d'informatique médicale (ANTIM) a été créée en 2008 sous la tutelle du Ministère de la santé par les autorités maliennes.

1.12.2 Aperçus du Pays

Le Mali est un pays continental situé au cœur de l'Afrique de l'Ouest. Il a une superficie de 1.241.238 km^2. Il est subdivisé en 8 régions administratives (Kayes, Koulikoro, Sikasso, Ségou, Mopti, Tombouctou, Gao, Kidal) et le District Central de Bamako qui a rang de région. Bamako est la capitale et compte environ 1.100.000 habitants.

Les régions sont subdivisées en cercles qui se répartissent en arrondissements. Dans le cadre de la décentralisation, au niveau local, le Mali compte 703 communes dont 684 communes rurales et 19 communes urbaines y compris les 6 communes du District de Bamako.

En 2010, la population est estimée à 14 500 000 habitants avec un taux d'accroissement intercensitaire de 2,2%. La majorité de la population du pays réside en milieu rural (73,2%). La situation sanitaire de la population du Mali, reflet du niveau actuel de développement socio économique, connaît aussi des améliorations significatives. Les dépenses totales de santé sont passées de 109 milliards en 1999 à 165 milliards en 2004 (CNS 1999-2004). Ces dépenses de santé proviennent essentiellement du financement direct des ménages (57%), des fonds publics (18%) et des fonds extérieurs (13%). Pour la période 1999-2004, les niveaux de morbidité et de mortalité du Mali restent parmi les plus élevés au monde et cela s'explique surtout par:

- une insuffisance des ressources financières allouées au secteur au regard des besoins de la politique sectorielle et du Programme quinquennal de Développement Sanitaire et Social (PRODESS);
- un environnement naturel insalubre et propice à la transmission des maladies infectieuses et parasitaires du fait d'une hygiène individuelle défectueuse et des comportements très souvent inadéquats face à l'environnement;
- une insuffisance de l'accès des populations à l'eau potable;
- des habitudes alimentaires sur le plan nutritionnel qui ont pour conséquence des apports nutritionnels non équilibrés et déficients aussi bien en quantité qu'en qualité (fer, iode, vitamine A), ce qui provoque des maladies et des carences;
- la persistance de certaines coutumes et traditions souvent néfastes pour la santé;
- un faible niveau d'alphabétisation, d'instruction et d'information de la population;

- une insuffisance en nombre et en qualité du personnel sanitaire et social.

Le Mali est classé selon l'OMS parmi les pays présentant une pénurie aiguë de personnel de santé, cette faible démographie se traduit par:

- 1 médecin pour 14.612 habitants (norme OMS 1 médecin pour 10.000);
- 1 infirmier d'État pour 18.145 habitants (norme OMS 1 pour 5.000);
- 1 infirmier pour 13.989 (normes OMS = 5.000);
- 1 sage femme pour 21.440 femmes en âge de procréer (norme OMS 1 pour 5.000).

Plus de la moitié du personnel socio-sanitaire du pays travaillent à Bamako: 57% des médecins, 41% des infirmiers et 64% des sages-femmes.

1.12.3 Objectifs et Stratégies

Mettre à la disposition du Ministère de la Santé, de ses services déconcentrés et décentralisés, et de tous les acteurs du système de santé l'ensemble des informations et données nécessaires pour la conduite de leurs activités en tant réel.Avec les axes stratégiques suivants:

- Renfoncement des structures technologiques supportant les services de Cybersanté;
- Télémédecine et Téléexpertise: expertise et fourniture des services et soins de qualité;
- Renforcement de capacité: formations initiale et continue, la gestion des connaissances, partage des bonnes pratiques;
- Statistiques sanitaires: flux et analyse de l'information sanitaire pour la prise de décision (situation sur le terrain, recherche, prévention, promotion, données sanitaires, données relatives aux infrastructures, aux équipements, aux ressources humaines, aux produits pharmaceutiques, aux vaccins, aux réactifs et autres consommables, données économiques et financières).

1.12.4 Activités Implementées

Les activitées implémentées par l'ANTIM sont de trois catégories:

- les activités de cybersanté pour soutenir l'administration de santé, à travers des solutions spécifiques s'adaptant aux réalités locales;
- les activités de cybersanté pour soutenir les pratiques cliniques et les soins aux patients, à travers des outils adaptés aux pratiques cliniques locales et la délivrance de soisn adaptés;
- les activités de cybersanté pour soutenir les activités de formation initiales et continues des professionnels de santé, avec des plateformes faciles à prendre en main et adapté aux conditions de faibles bandes passantes.

1.12.5 Technologies et Solutions Deployées

L'agence a déployé des solutions intégrées de cybersanté et d'autre sont en phase de test pour diffusion ultérieure.

Solutions pour l'administration de santé: faire de l'administration numérique une réalité quotidienne au sein du ministère de la santé au Mali avec:

- LE SITE WEB: il a été developpé avec le CMS joomla et intègre l'ensemble des textes législatifs du ministère de la santé et les textes généraux du gouvernement du Mali, est le lien électronique entre le ministère et les usagers. Il a permis à l'agence de gagner le prix du jury aux TIGA Awards 2009 de la comission économique des nations unis pour l'Afrique.

- IRED MAIL: Système sécurisé de gestion intégré de la messagerie électronique avec fonction d'annuaire informatique pour les professionnels de santé permettant aux utilisateurs des services web du ministère de la santé de s'identifier une seule fois.
- LA VISIOCONFERENCE AVEC UN PONT RMX 1000, DES STATIONS POLYCOM VSX 8000 ET SOLUTION LOGICIELLE POLYCOM PVX: Ce qui permet au ministère de la santé de tenir plusieurs réunions virtuelle par visioconférence depuis Février 2008. En 2009, le passage à échèle a été effectif avec les multiples participations du ministre aux rencontres internationales et audiences interministérielles.
- Solutions cliniques (télémédecine et informatique médicale): soutenir la santé des usagers par une utilisation judicieuse du numérique.
- REEVASAN: Réseau Electronique d'Evacuation Sanitaire qui est une plateforme en ligne basée sur le moteur de IPATH (Internet Pathology) pour la gestion des évacuations sanitaires en ligne du ministère de la santé. Cet outil a aussi été utilisé pour préparer plusieurs mission humanitaires qui sont venu faire des interventions gratuites au Mali.
- IKON: qui est une plateforme de téléradiologie, permettant aux radiologues spécialistes de Bamako de donner leur second avis sur des clichés pris dans les hôpitaux régionaux (Kayes, Sikasso, Ségou, Mopti, Tombouctou et Gao).
- PESINET: est la première plate-forme mSanté supporté par l'ANTIM. Il consiste à l'utilisation du téléphone mobile pour le suivi des enfants de 0 à 5 ans. A chaque visite des enfants, les agents de pesée saisissent les poids et les données annexes concernant la santé de l'enfant (vomissements, diarrhées,…) sur un téléphone portable. Ces données sont enregistrées sur la mémoire du portable, puis transmises, via le réseau GPRS, sur une base de données.
- FRONTLINESMS: est un logiciel installé sur un téléphone mobile qui permet l'envoi et la reception de message SMS. En utilisant ce logiciel, un ordinateur branché à un téléphone portable devient un centre de communication à faible coût. C'est la plateforme qui a été utilisé dans le projet de remonter de l'information sur les décès maternels et infantiles et les stocks de produits de santé de la reproduction avec le soutien du fond des nations unies pour les activités de population (FNUAP).
- GRH PROS SANTE 21 (GRH PS21): est un logiciel de gestion des ressources humaines en ligne customisé par l'ANTIM pour les pays francophones sur la base de la plateforme iHRIS de capacity project (USAID).
- MEDIBOARD: est un système web libre de gestion d'établissement de santé. Il se définit plus précisément comme un SIH (Système d'Information Hospitalier) c'est-à-dire un PGI (Progiciel de Gestion Intégré) adapté aux établissements de santé de toute taille, du simple cabinet de praticien au centre médical multi-sites.
- OPENCLINIC: Le système d'information médicale et hospitalière OpenClinic est une solution dédiée pour structures sanitaires hospitalières et de premier niveau. Il intègre, outre la gestion classique d'une structure sanitaire, des outils de reporting d'activité conçus spécialement pour l'approche district et répond donc à une double préoccupation: avoir de l'information sur les pathologies et les activités, ce qui permettra de mettre en œuvre plus facilement un système de gestion basée sur la performance, mais sera également précieux dans le cadre de la mise en œuvre future d'un système d'assurance maladie (ou des systèmes d'exemption de paiement).
- Solutions pour la formation: faire de la formation à distance une alternative attrayante pour les professionnels de la santé au Mali.
- DUDAL: est un outil de téléenseignement à faible bande passante. Développée par le réseau RAFT à partir du système e-cours de l'Université de Genève, elle est basée sur des technologies totalement logiciels libres. N'importe quel PC java compatible peut recevoir les cours. Chaque jeudi les professionnels de santé des structures sanitaires suivent des cours diffusés sur cette plateforme dans le cadre de la formation médicale continue et du renforcement de capacité.

- ELLUMINATE/BLACKBOARDTM: La plateforme Elluminate est un outil de téléenseignement à faible bande passante développé par la société Elluminate INC du Canada. Elle est basée sur la technologie java comme dudal et est multi environnement. Cette plateforme est utilisée au niveau de l'agence de télésanté pour soutenir le programme de formation initiale en maintenance biomédicale, en collaboration avec l'Institut National de Formation en Science de la Santé et le collège communautaire de Barthust au Canada.

1.12.6 Changements et résultats obtenus

Le premier résultat obtenu pour le Mali est l'institutionalisation de la cybersanté. Depuis la création de l'agence les questions de cybersanté ont été prises en compte dans les formulations des politiques sanitaires et de leurs stratégies de mise en œuvre. Ainsi dans le document du programme decenal de développement socio-sanitaire prolongé 2011, le système entendr tré explicitement profit des avantages qu'offernt les technologies de l'information et de la communication.

Par ailleurs les outils web mis en place permetten de rendre plus facilement accessible les informtions sur le système ce qui a eu un fort impact sur la prise de décision à temps.

Il faut noter que grâce aux différents projets pilotes d'utlisations de la téléphonie mobile pour améliorer l'accès des mères et des enfants aux services de santé de qualité, l'ANTIM a été lauréat en 2011 des prix TIGA 2011 catégorie e-santé de la comission économique des nations unis pour l'Afrique.

1.12.7 Défis et facteurs de réussite

Malgré les résultats obtenus, il reste de nobreux défis à relever qi sont essentiellements de trous ordre:

- Les problèmes liés à l'interopéranbilité des outils et solutions déployés, surtout quand il n'y a pas suffisament de coordination entre les initiatives des différents acteurs,
- Les problèmes de connectivité, faiblesse des bandes passantes et cout elevés de l'accès à Internet,
- Les problèmes de changement de comportement, l'innovation fait souvent peur et son adoption fait face à des resistances,
- Enfin les problèmes de financement structuré des activités de cybersanté surtout à partir des budgets alloués à la santé.

Toute fois les facteurs de réussite sont l'existence de champions locaux qui pousse les projets de cybersanté, la disponibilité de ressources humaine qualifiées dans le domaine de la cybersanté, la volonté politiques des autorités sanitaire d'adopter la cybersanté comme moyen de renforcer le système de santé.

1.12.8 Leçons apprises et prochaines étapes

Les projets pilotes et initiatives de la société civile sont nécessaire spour demarrer des activités de cybersanté. L'institutionalisation est l'étape primordiale pour preparer le passage à échelle. Le passage à échelle a besoin de resources financières conséquentes pour que l'utilisation de la cybersanté face la différence pour améliorer les sytèmes de santé.

Enfin la perspective la plus importante pour le Mali est la suivante:

- Utiliser la cybersanté pour renforcer et améliorer le système d'information sanitaire.
- La détection des cas de maladies, le lancement des interventions pour prévenir la transmission ou réduire la morbidité et la mortalité, l'identification de nouveaux problèmes de santé (des maladies émergentes et/ou négligées), la mesure des tendances sanitaires et la recherche, nécessitent des données en général produites par la surveillance épidémiologique et le recueil périodique des données des systèmes de santé. Cette surveillance épidémiologique et ce recueil périodique des données des systèmes de santé constituent un mécanisme systématique de collecte, d'analyse, d'interprétation et de dissémination des informations sanitaires.

Pour le renforcement des systèmes d'informations sanitaires deux impératifs sont à respecter:

- Il convient de renforcer les systèmes d'information et de statistiques sanitaires dans leur ensemble plutôt que de s'intéresser à une maladie spécifique.
- Il faut tout particulièrement renforcer le rôle directeur des pays dans la production et l'utilisation de l'information sanitaire.
- Il s'agit de produire des informations pertinentes dont les parties prenantes du système de santé peuvent se servir pour prendre des décisions transparentes qui reposent sur des bases factuelles concernant les interventions sanitaires.

La cybersanté peut aider les pays à accroître considérablement leurs moyens de stockage de données et à réduire les délais précédemment nécessaires pour leur traitement. Les technologies de l'information et de la communication peuvent donc améliorer de manière spectaculaire la disponibilité, la qualité, la diffusion et l'utilisation des données liées à la santé. Si les TIC permettent d'accroître le nombre de données recueillies et d'en améliorer la qualité, elles permettent aussi de réduire les délais et d'améliorer l'analyse et l'utilisation de l'information. Une infrastructure de communication est donc nécessaire pour exploiter pleinement les informations qui sont disponibles.

Au niveau central et local, les responsables de la santé doivent donc avoir accès à une infrastructure de l'information offrant notamment des ordinateurs, le courrier électronique et un accès Internet. Bien que l'accès à Internet soit de plus en plus important, les systèmes téléphoniques de base (fixes ou mobiles) restent toujours extrêmement utiles.

Un renforcement cohérent des capacités portant sur les moyens électroniques et les ressources humaines dans l'ensemble du système de santé constitue une approche efficace.

Le minimum requis est une base de données sur les établissements de santé et les services essentiels fournis. Il faut ensuite cartographier les établissements, les ressources humaines, les budgets et les dépenses, les produits de base et les services essentiels aux niveaux national et du district. Un équipement GPS (Global Positioning System) et un système d'information géographique (SIG) sont en général utilisés pour déterminer la position géographique des sites de prestation de services et les frontières administratives, et pour les localiser sur une carte informatisée. En effet, la cartographie des ressources disponibles, des interventions spécifiques ainsi que des pathologies peut fournir des données importantes du point de vue de l'équité, et encourager les efforts visant à ce que les interventions nécessaires soient menées dans les zones périphériques et ne restent pas concentrées dans les centres urbains.

Lorsque des infrastructures de communication électronique sont disponibles, les données peuvent être saisies au niveau décentralisé pour pouvoir être immédiatement notifiées à tous les niveaux.

Enfin, le but du stockage, de l'assurance qualité, et du traitement et de la compilation des données est de présenter des informations utiles de manière crédible, cohérente et pertinente. Les données doivent être intuitives et évidentes pour les acteurs du système d'information sanitaire. Pour que l'information soit intelligible, il faut qu'elle soit lisible. Les contenus du système de gestion des données doivent être clairement libellés. Les acteurs de ce système souhaiteraient également pouvoir séparer et combiner les données du système de différentes façons. Les outils qu'ils utilisent pour accéder au système doivent être simples et faciles à utiliser, et doivent permettre de répondre aux demandes qui ont été formulées dans des délais très courts.

Une information n'a de valeur que lorsqu'elle est intégrée à d'autres informations et qu'elle est évaluée à la lumière des problèmes auxquels le système de santé est confronté. A ce stade, une information devient une base factuelle qui peut être utilisée par les décideurs. Ces bases factuelles, une fois regroupées, sont encore plus utiles lorsqu'elles sont mises en forme aux fins de présentation, de communication et de diffusion aux décideurs, de manière à changer leur perception des questions et des besoins de santé. On entre alors dans le processus de transformation des bases factuelles en connaissances qui, une fois appliqué, peut se traduire par des décisions ayant un impact direct sur la santé et sur l'équité en santé. Le

système d'information sanitaire permet ensuite de mesurer cet impact réel sur la santé, ainsi que l'évolution des indicateurs de santé.

La prise de décision est itérative et fondée sur des données factuelles, tout en s'appuyant sur un système d'information sanitaire complet à l'échelle d'un pays.

Un système d'information sanitaire n'a pas seulement pour but de produire des données de qualité, dans l'espoir qu'elles soient ensuite utilisées; il doit aussi les convertir en données crédibles et convaincantes qui éclairent les décideurs au niveau local. Des données de qualité stockées dans des systèmes d'archivage bien structurés n'ont guère d'intérêt si les utilisateurs ne peuvent y accéder pour produire des informations utiles à la prise de décision.

Beaucoup d'innovations se sont récemment produites dans le domaine des TIC et ont permis de présenter des informations et des bases factuelles complexes dans des formats qui attirent l'attention des décideurs et de communiquer efficacement les messages contenus dans l'information. Certaines méthodes s'appuient sur un accès via Internet ou un ordinateur à des données provenant de systèmes d'archivage ou d'observatoires présentées sous une forme interactive. De nouveaux outils d'analyse informatisés permettent d'établir des rapports normalisés riches en présentations graphiques (et même cartographiques) de l'information. Les formulaires de notification, les descriptifs et les résumés normalisés sont également très efficaces. Ces formats doivent orienter les décideurs en leur fournissant des interprétations fondées sur les conséquences probables des décisions et des scénarios de rechange qu'ils envisagent. L'information peut également être diffusée par l'intermédiaire d'ateliers, de revues médicales, de réunions entre homologues et des médias.

La mise en place d'une architecture de l'information en tant que ressource commune au niveau national et du district est une étape indispensable pour améliorer les pratiques en matière d'information et pour pouvoir effectuer les analyses de qualité nécessaires. C'est à partir de ce niveau d'analyse que les résultats sont utilisés pour l'élaboration des politiques et la planification stratégique. Ces analyses, interprétations et activités de sensibilisation ne sont pas spontanées. Elles requièrent en effet la mise en forme, la communication et la diffusion selon une présentation et dans un langage accessibles aux décideurs de haut niveau. Un aspect qui est souvent négligé dans la plupart des systèmes d'information sanitaire.

L'une des fonctions les plus importantes du système d'information sanitaire est de relier la production à l'utilisation des données. Ceux qui sont chargés de collecter les données doivent aussi tirer parti de leur utilisation. Les utilisateurs comprennent les prestataires de soins, les responsables de la gestion et de la planification des programmes. De manière plus générale, les utilisateurs comprennent ceux qui financent les programmes de soins dans les pays (ministères de la santé et des finances) et à l'extérieur (donateurs, banques de développement et organismes d'appui technique). Les utilisateurs des données sanitaires ne se limitent pas aux professionnels des soins de santé, aux gestionnaires et aux statisticiens. La prise de décision concernant les priorités de santé d'un pays implique nécessairement les populations, la société civile et les décideurs.

1.13 Niger: E-health Status and Prospects in Niger

1.13.1 Current Status

[14]The implementation of e-health in a country often calls for the establishment of either an e-health policy or an ICT development policy with an e-health component. In Niger, there is something of a blank

[14] Contribution: Yaya Arouna, Telecom Engineer, Multisectoral Regulatory Authority (ARM), Niger. See document SG02-C-017

slate, insofar as, apart from the NICI plan[15], there is nothing to suggest that there are any policies, standards or legal or institutional arrangements in this area.

There are however some activities that may be considered as falling within the domain of e-health, namely communications using VSAT to connect regional structures to the districts under a project known as RAFT (Telemedicine Network in French-speaking Africa).

The activities focus primarily on remote radiology between national, regional and district hospitals, remote consultation and remote expertise using the RAFT Ipath tool, as well as distance learning with weekly RAFT e-courses every Thursday at 0900 hours UTC.[16]

There has also been some institutionalization of e-health with the establishment of an E-health Development Support Unit under the responsibility of the office of the Minister for Public Health.

Even though these are only very basic steps, it is encouraging to note for the future that Niger is getting involved in a regional movement towards establishing a genuine e-health framework in order to address and overcome some of the inherent problems within the health system, with the aim of achieving the MDGs. What does this movement entail?

1.13.2 E-health prospects

Rather than confining themselves to a national perspective, the member countries of the Economic Community of West African States (ECOWAS), including Niger, have shown a clear desire to move forward together as a region.

With this is mind, they have envisaged an e-health strategic plan for this regional African block. The plan sets out the vision and strategic orientations, along with implementation projects. It is these aspects which we will try to develop for the future of e-health in Niger.

1.13.3 Vision

The ECOWAS countries are committed to implementing e-health through an agreed vision: "*E-health: reducing distances and improving access for rural populations in particular to quality health services in an integrated space*". A strategic plan[17] with orientations has been established for the period 2011–2013.

1.13.4 Strategic orientations

Several strategic directions have been defined to ensure the success of the plan, whose primary aim is to significantly improve the quality of the management of health and treatment systems for the populations of the region, by developing and supporting integrated health policies and reform initiatives.

These strategic directions are as follows:

- Strengthening countries' systems using e-health as a means of improving coordination, harmonizing human resources policies and management in the health domain within the regional Community space.
- Use e-health to strengthen and improve the health information system.
- Integrate e-health in the overall service portfolio of health structures within the Community space.
- Ensure the availability of a reliable and sustainable subregional infrastructure capable of supporting e-health applications.

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15 Plan for the implementation of a governmental intranet. http://www.pnud.ne/RaportplanNICI.pdf.

16 Strategic plan for the development of e-health in ECOWAS – 2011 to 2013.

17 http://www.sante.gov.ml/docs/PSDC_OOAS_1er_fevrier2011.pdf.

- Use e-health as a means of initial and continuous training, knowledge management, promotion and dissemination of good practices within the Community space.
- Use e-health to support research activities.
- Use e-health to promote traditional medicine.
- Ensure that e-health is accepted and adopted by all stakeholders, through successful change management.

It is these defined directions that must guide projects to be implemented. We shall confine ourselves here to highlighting a few projects which appear to be the most important.

1.13.5 E-health Implementation projects

The projects identified include:

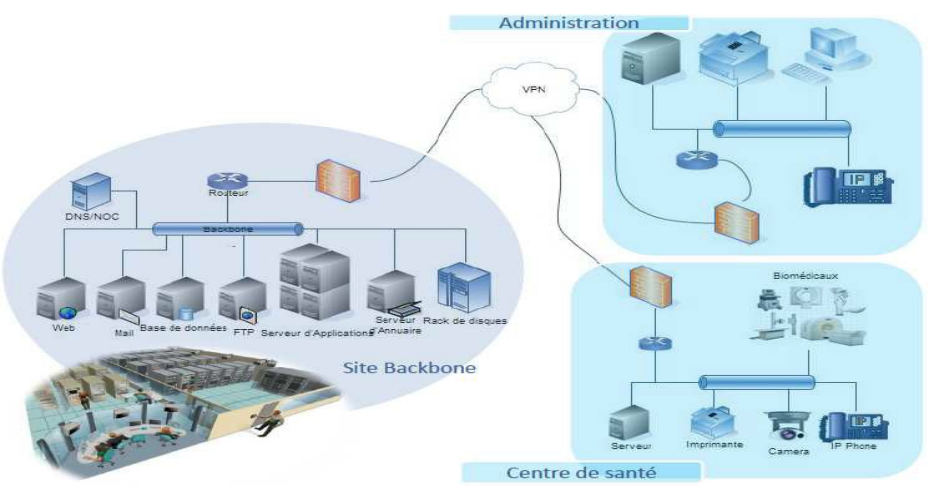
- **Project for the elaboration of a national e-health plan**

Under this project, each member state, including Niger, is to draw up a national e-health plan (NEHP).

- **Project for a national health data repository (NHDR)**

Countries' health systems are confronted by serious problems of management, storage and archiving of data collected by the various health information subsystems. This observation is corroborated by recurrent delays in the publication and dissemination of collections of health information statistics.

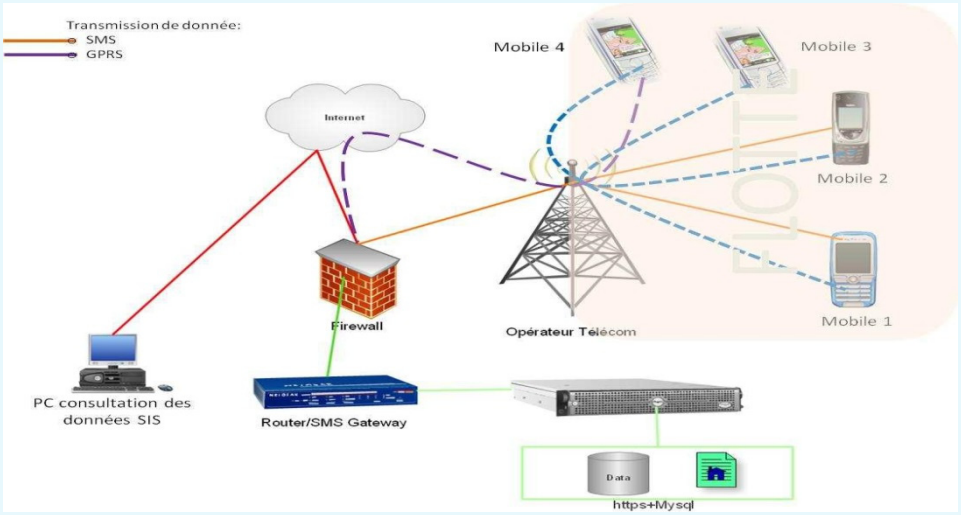
Figure 9: Project for a national health data repository (NHDR)



The NHDR is a comprehensive and definitive solution to the problems of management, dissemination, use, storage and archiving of health information.

NHDR is a reliable medium supporting various applications: telemedicine, medical information (Clinical Information System, Medicine Information System, Radiology and Laboratory Information System, etc.), administrative management, health information system and planning.

Figure 10: Project for a mobile health fleet



The objective of this project, in the mind of its developers, would be to allow real-time and secure transmission of health information using mobile telephony and to automate the process of analysing, processing and disseminating health information.

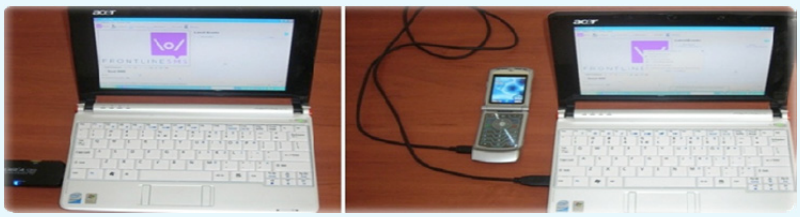
To this end, technological solutions are considered, as described in brief below.

The idea is to network mobile telephone terminals supporting the transmission of data and sms. The fleet also supports voice. An infrastructure diagram for such a mobile fleet is shown below.

Terminals are loaded with forms to be completed with data in the field, which once captured will be transmitted via GSM terminals or smartphones to specially-equipped servers in the NHDR.

The data transmitted are automatically processed and can be exploited by any authorized health professional. In addition to data transmission for the health information system, health professionals with terminals in the fleet can communicate with each other by voice and sms. The terminals in the fleet can only communicate with each other.

Figure 11: Terminals in the fleet



- Physical infrastructure

The physical infrastructure consists of mobile terminals and the infrastructure of the suitably equipped NHDR. The mobile terminals are GSM phones, smartphones and netbooks.

- Software solution

FrontlineSMS is a freeware allowing the sending and reception of sms messages. Using this software, a computer connected to a mobile phone (see Figure 11) becomes a low-cost communication centre. Only the operator's sms price is charged.

Figure 12: Computer converted into an sms communication centre

Use of the Patient View module creates a new user interface in FrontlineSMS. It allows all relevant data concerning a patient to be displayed. Health workers will also be in a position to sort, update and add new entries concerning the patient via the central computer and the mobile phone. This yields a mini computerized medical file, as shown in Figure 12**.**

In addition to these projects, it should be mentioned that, in cooperation with India, a project for a pan-African e-network with an e-health component is under way, which provides for the installation of a VSAT in the national hospital (NH) at Lambordé (university hospital centre).

1.13.6 Conclusion

It clearly emerges that, in terms of e-health, Niger is really only at the planning stage. Today, based on the current development of the telecommunication/ICT infrastructure, Niger intends to speed up these projects. To this end, it will be requesting ITU/BDT support through the relevant programmes, in particular Programme 5, whose purpose is to help least developed countries (LDCs) members of ITU with targeted assistance for their economic and social development.

1.14 Pakistan: e-Health in Pakistan

1.14.1 Telehealth initiatives in Pakistan

- [18]Telemedicine/e-health Training Centre was established at Holy Family Hospital, Rawalpindi to train medical staff of the region in telemedicine applications. This was a joint collaboration between ministries of science and technology of Pakistan and USA. The project was a six months' pilot in which a model training centre was established in Holy Family Hospital and connected to a remote telemedicine centre in a rural area. This has acted as a training ground for telemedicine training of doctors and nurses. In the initial phase 45 doctors and nurses from Rawalpindi region were trained in telemedicine applications.

[18] Asif Zafar Malik, Professor of Surgery, Holy Family Hospital, Rawalpindi, Pakistan. See document RGQ14.3.2-INF-0003

- Ministry of Information Technology: Health Net Project - Ministry of Information Technology launched its Health Net Project in November 2007 and this initiative is in the implementation phase. This project is being funded by Federal Ministry of Information Technology for three years with a commitment from Provincial Governments of Punjab and Sind to continue and bear the cost of recurring expenditure. MoIT-Health NET is a telemedicine project meant to assist the government in transforming delivery of healthcare services and making them available at the door-steps of the common man, through the use of Information and Communication Technology.
- The project demonstrated the use of technology as a solution for overcoming the lack of quality healthcare infrastructure in rural/remote areas of Pakistan. The objective is being achieved through setting up telemedicine hubs in tertiary care centres connected via PAKSAT-1 to 4 telemedicine centres in rural hospitals, by utilizing and complementing available national resources and infrastructure. A total of fifteen satellite based telemedicine centres have been established all over the Pakistan. Tertiary care centre at Holy Family Hospital, Rawalpindi and Mayo Hospital, Lahore in Punjab Province and one hub centre JPMC, Karachi in Sind Province have been identified as hubs for providing telemedicine consultations to their remote catchment areas. Each of these hubs has been linked with four remote sites through satellite connectivity. All these centres are equipped with telemedicine peripherals to facilitate the teleconsultations in radiology, Surgery, Medicine, Cardiology, Otolaryngology, Dermatology, psychiatry and orthopaedics. Regular consultations are being provided to remote patients through this network. The Government of Pakistan has taken a bold initiative to utilize ICT for transforming delivery of public services by making such services more effective, inclusive, efficient and available at the door steps of common men. Setting up rural telemedicine centres has enabled rural population to seek consultation, advice and treatment from specialist doctors in urban centre hospitals, without having to travel hundreds of kilometres and spending their meagre financial resources on related transportation and accommodation costs. The project also provides training in advanced treatments and diagnostics to doctors working in rural/remote hospitals, through interaction with specialist doctors in urban hospitals. In the last three years thousands of patients in these remote districts have benefited from the Telemedicine rural support program.

1.14.2 e-Health initiatives: The Aga Khan University Karachi (AKU)

- Telehealth/telemedicine: Tele-radiology Project between AKU and French Medical Institute for Children (FMIC) Kabul, Telehealth Project in Northern Areas of Pakistan (Districts Gilgit, Gizar and Hunza) extending up to the Pakistan China Border.
- Health Informatics: Developed 47 integrated clinical information systems, PACS are implemented according to global standard. AKU is also conducting a Cost Benefit Analysis of available Hospital Information management system. The University is working with Ministry of Health (HMIS-cell) in designing and implementing Real time Bio Surveillance system for the country.
- E-Learning
- Geographic Information Systems (GIS) GIS: Environmental Health, GPS use in Tobacco Control study to collect point data

1.14.3 Ministry of Science and Technology: Multitasking of Telemedicine/E-Health Training Centre

- Joint collaboration between USA and Pakistan in field of science and technology opened a new era of telemedicine training. This has led to the establishment of Telemedicine/E-health training Centre at HFH to train doctors and nurses in the field of telemedicine.
- Telemedicine/E-Health training centre is a designated facility for e-health training and is jointly working with Virginia Commonwealth University, USA. Four remote hospitals are attached to the centre through satellite connectivity. These hospitals are DHQ hospitals in Attock, Khushab, Gujrat and THQ hospital, Pindi Gheb. This centre has trained more than 100 doctors and nurses in

Telemedicine applications so far. In the initial phase medical staff from Rawalpindi/Islamabad region was trained and now in the second phase 60 more people have been trained. These trainees were from various institutions all over Pakistan and after completing their training are actively using telemedicine to strengthen healthcare delivery in their own institutions.

- Telemedicine/E-Health Training centre also established tele-rehabilitation centre in Muzzafarabad, Kashmir for paraplegics of recent earthquake. During the earthquake of 2005, 194 paraplegics (because of spinal cord injuries) were brought to Rawalpindi Medical College and allied hospitals. These patients received their initial treatment at these hospitals and were discharged after that. The hub of this Tele-rehabilitation network is at Holy Family Hospital. The remote centre is in Muzzafarabad hospital. Telemedicine/E-health training centre will train patients and their attendants in utilization of Tele-rehabilitation services. Development of pressure ulcers, which are a known complication of paraplegics, will be monitored. Physiotherapy measures will be taught to patients and progress will be evaluated. Moreover satisfaction of patients and their attendants regarding the use of this technology will be evaluated.
- US State Department's Pakistan Telemedicine Project – is providing expanded medical care – pre-operative planning and follow-up; cardiac assessment; ophthalmology, dermatology, radiology, infectious disease, and perinatal evaluations; and medical triage for traumas and acute illnesses. Another important aspect of the project is building capacity for healthcare services via virtual clinical grand rounds for medical education. The partnership includes Wateen Telecom, Motorola Inc., Medweb Inc., USAID, the U.S. Department of Defense Telemedicine and Advanced Technology Research Center, the Pakistani Government, and Telemedicine & E-Health Training Center, Holy Family Hospital in Rawalpindi and District Headquarters Hospital in Attock.
- Emergency Telemedicine Response in Pakistan.

1.14.4 Role of International Telecommunication Union

- The 2005 Earthquake of Pakistan left widespread destruction, killing at least 80,000 people, severely injuring another 70,000 and leaving 2.8 million people without shelter. Telemedicine center developed mobile telemedicine units with collaboration of International telecommunication union (ITU) and INTEL. International Telecommunication Union provided on loan 15 Inmar-Sat Satellite modems to be deployed in areas where there was no communication available. Telemedicine centers were established in NWFP and AJK, most affected areas of Pakistan. These centers were established in existing relief hospitals. The Medical staff got consultation about the earthquake victims from consultants at the hub.
- On 10th December 2007, the International Telecommunication Union (ITU), and the Telemedicine & e-Health Training Center, Holy Family Hospital of Rawalpindi in Pakistan signed a Memorandum of Understanding (MoU) for Cooperation in Disaster Preparedness and Response through Telemedicine and e-Health. The Parties have already successfully collaborated in the area of telemedicine and emergency telecommunications following the massive earthquake that struck the Pakistan-India border area in October 2005, during which a total of 25 medical doctors were trained in the use of 55 satellite terminals in delivering telemedicine services and applications. The Parties intend to implement joint projects/activities, share information on e-Health, and cooperate on enhancing access to information related to emergency telecommunications and telemedicine for disaster preparedness and disaster relief.
- Emergency Response Telemedicine Vehicle: 2009 – Holy family hospital (HFH) was one of the hospitals actively involved to provide health care to Internally Displaced Persons (IDPs) of Swat and Mardan districts. Apart from mobilizing teams to provide on-site medical care, telemedicine was added to strengthen these services. Initially, teams comprising of doctors of all major specialties like Surgery, Medicine, Ob/Gyne, ENT/EYE and Paramedics were in Mardan. It was then possible to cover all other specialties and at the same time have opinions from senior medical staff based at Holy Family Hospital. This was possible by Mobile Telemedicine vehicle made operational under supervision of Telemedicine/E-Health Training Center at Holy Family Hospital. Teams from HFH

including doctors and paramedics were sent to refugee camps to address their medical problems. Specialist support to these teams was provided through Teleconsultations utilizing a Mobile Telemedicine vehicle. This was indigenous customization of an ordinary vehicle. The capsule of the vehicle was designed and developed locally. The satellite dish for communication was mounted on the top. The vehicle was further equipped with Video Conferencing equipment and telemedicine tools like general examination camera, Otolaryngoscope, ECG, related medical and IT equipment. Satellite connectivity was provided by Pak Datacom. The medical staff at refugee camps, after initial evaluation of the patients, used to discuss it with specialists at HFH for further evaluation and management.

1.14.5 Floods in Pakistan in 2010

- Multitasking of Existing Rural Telemedicine network
  - Rajanpur and D.G. Khan are in the middle of the worst affected areas of lower Punjab. Hospitals in these cities are part of the Telemedicine network of rural support program Pakistan. Fortunately these facilities were not damaged during the floods. Telemedicine and e-Heath training centre streamlined the Emergency Telemedicine response in the wake of foods utilizing the existing satellite network provided by the Ministry of Information and Technology. Mayo Hospital Lahore and Holy Family Hospital Hubs have been running virtual clinics and providing teleconsultations to patients in attending remote sites.
  - The methodology is simple, utilizing video link. Specialists from Departments of Medicine, Paediatrics, Dermatology and other specialities are available daily according to schedule provided to remote sites. The IT resource person and paramedics at the remote sites are facilitating these consultations while staff at the local hospital is busy providing care at camp sites. Since the start of these services more than 3593 patients have received treatment. Predominant amongst these are skin conditions and waterborne diseases like Gastroenteritis as predicted and expected. This data is extremely useful for Health departments to plan relief operations by mobile health teams.
- Mobile Telemedicine centres in Gilget, Baltistan, Rural Sindh and Punjab:
  - International Telecommunication Union was once again in the forefront to assist Pakistan during the floods. It airlifted equipment for Telecommunication like data terminals, Inmarsat satellite modems and Satellite phones. Federal Ministry of Information Technology coordinated these efforts by releasing the equipment, and getting relevant licences from PTA for using this equipment. Telemedicine and e-Health training centre was entrusted the task of training and coordinating these efforts in setting up mobile telemedicine centers. On-site training was arranged for staff of AKU, HDF, SEECS (NUST) and Attock district staff. These centres are operating all over the country, and ITU has very kindly extended the connectivity period for a further three months.
- International e-Health Conferences in Pakistan:
  - First International e-Health Conference – The e-Health Association of Pakistan organized its first International e-Health Conference at the Aga Khan University, Karachi on 23-24 January 2010. The conference was telecasted live at the National University of Science and Technology, Islamabad. The conference attracted stakeholders from the Ministries of Health and Information Technology, National and International development organizations, health care institutions, academic institutions in health, engineering and telecommunication, and students from a variety of disciplines. Several keynote addresses, scientific sessions, workshops and panel discussions were arranged to provide opportunity to the experts, researchers, and participants to share their views.
  - Second International e-Health Conference – The e-Health Association of Pakistan organized its Second International e-Health Conference at the International Islamic University, Islamabad, Pakistan on 22-23 January 2011. The conference was telecasted live at the Aga

Khan University, Karachi. This Conference was a unique feature in Pakistan, allowing healthcare providers, allied health professionals, IT experts, telecommunication companies, managers, and educational institutions in health, biomedical and IT fields to reflect on ways to collaborate for improving health of the population.

- e-HAP Workshops – Considering the growing demand of e-Health, a two-day Knowledge Sharing Workshop "e-Health Knowledge Sharing workshop", was organized by e-Health Association of Pakistan (e-HAP) in collaboration with LIRNEasia, Sri Lanka on 29-30 September 2010 at Islamabad Club, Islamabad, Pakistan. The purpose of the workshop was to share and compare the findings of e-Health initiatives in Pakistan and other South East Asian countries. The workshop was attended by representatives from the Ministries of Health and IT, public and private healthcare institutions, NGOs and academic institutions.

1.14.6 Research and Development in e-Health Pakistan

- NUST University Islamabad: Healthcare Applications Interoperability through Implementation of HL7 Web Service Basic Profile.
- FAST University Islamabad: Next Generation Intelligent Networks Research Centre Remote Patient Monitoring System with Focus on Antenatal Care.
- LUMS, LAHORE: A Low Cost Ultrasound Training Simulator: Investigating Wavelet based Video Coding and Video Conference Applications.
- Aga Khan University: PANACeA project (PAN Asian Collaborative for Evidence-based e-Health Adoption and Application):
  - Research in e-Health in 12 Asian countries. Use of Mobile Phone in Bridging the Gap for Referral of Pregnant Women.
  - Mainstreaming e-Health initiatives in primary care: an evidence-based approach Online TB Diagnostic Committees for Clinically Suspect Sputum Negative Patients in the TB-DOTS Program.
- Regional and International Cooperation: Telemedicine/E-health.

Pakistan is playing a key role in establishing collaborations internationally and in the SAARC region, to promote e-health by partnering with International organizations like: APT, SAARC, WHO, ATA and Rockefeller Foundation.

1.15 Tanzania: Status of e-Health in the United Republic of Tanzania

1.15.1 National Optical Fiber Backbone: For Telemedicine Services

[19]The e-governance initiative of the Government of Tanzania is to establish the National Fibre Optic Backbone to provide essential connectivity for e-services. The network now covers all regional centres and will be extended to all districts beginning the second half of year 2012. We are planning to take advantage of this e-governance initiative to establish the connectivity needed for telemedicine.

In June 2011, the India-Tanzania Centre of Excellency in ICT provided, among other things, telemedicine related facilities (bed + mattress; ECG Machine; DVD Player; X-ray Scanner; Microscope with Digital Camera; TV Screen; Conferencing camera and telemedicine software) which have been installed in 10 hospitals.

[19] Contribution: Deogratius A. Moyo, Tanzania Communications Regulatory Authority (TCRA), Tanzania (United Republic of). See document SG02-C-0228

In mid 2011, the Hon. Prof. Makame Mbarawa, Minister of Communication, Science and Technology called a stakeholders meeting to discuss on how to harmonize the telemedicine initiatives in Tanzania. During that meeting, the National e-Health Committee was formed including members from different organs as outlined below. It was further agreed that, to start with as pilot project, two rural hospitals and three referral hospitals will be connected this year. Currently, all necessary preparations for establishing this pilot project are in place. The project is planned to offer the following categories of services:

- Consultations with Specialists: patient/doctor consultation through mobile phones or internet;
- Videoconferencing: Clinical Case presentations, Clinical Pathological Conferences, Tumor Boards, State of the Art Presentations by specialists;
- Continuing Medical Education: Clinical Materials prepared by Specialists, Service Policies & Procedures for quality improvement, and Pre-service training of various health professionals.

1.15.2 Challenges

The connectivity and operation of this project, however, faces some challenges as follows:

- High cost in connectivity from the National Telecommmunications company.
- Lack of fund for training of doctors and nurses.
- Lack of sustainability assurance.
- No framework for telemedicine and related policies, regulations and procedures.
- Telephone Communications among Health Workers

Communication among health workers is essential for consultations, referrals and facilitating the telemedicine services. In 2011, the National Referral Hospital in Dar es Salaam (Muhimbili) initiated a plan to establish a closed user group among health facilities, staff and doctors within hospital through mobile network services from national telecom company (Tanzania Telecommunications Company Limited-TTCL). In this initiative, all doctors, wards, laboratories and radiology sections were included in a closed user group with freely unlimited calls among them. Extension of the closed user group countrywide is constrained by limited coverage of TTCL mobile services.

While TTCL is exploring the possibility of integrating their landline services for countrywide coverage, the Ministry of Health and Social Welfare (MOHSW) has agreed to join efforts with Switchboard Company of the USA and one of the largest mobile company in Tanzania (Vodacom Tanzania Limited) to establish a mobile closed user group to include all key health workers in all Vodacom covered areas in Tanzania. There will be no direct financial implications to MOHSW and all voice calls and text messages within the group will be free. An MOU is being finalised and network establishment is planned to start this year.

1.15.3 Recommendations

Following the challenges faced by the Government of Tanzania in implementing e-health services, we appeal to ITU and other players for support in knowledge sharing, fund, and training.

1.16 Turkey

1.16.1 Case 1: TEPE – Turk Telekom Technological Cooperation: Integrated Healthcare Management Information System

[20]Integrated Healthcare Management Information System (IHMIS) is realized by TEPE Technologies and Turk Telekom Cooperation. IHMIS is an integrated software system that permits to manage and store all data of "A Class" Healthcare Providers. In this cooperation, the software system is provided by the TEPE Technologies and Turk Telekom provides 2 Mbit internet connection and personal data security.

IHMS can be a good example of the cooperation between telecommunication companies and software information companies in the health sector.

Introduction

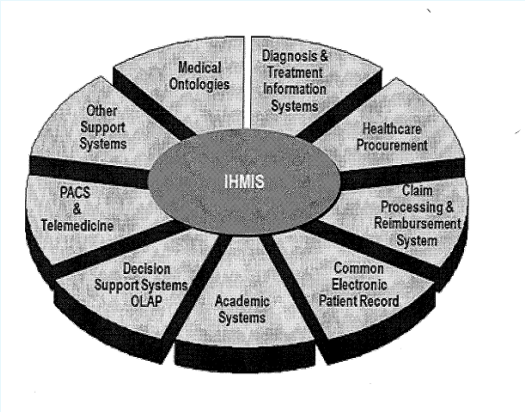
Integrated Healthcare Management Information System (IHMIS) is designed by TEPE Technological Services. IHMIS is an integrated software system that permits to manage and store all data of "A Class" Healthcare Providers. The main purpose of IHMIS is to serve the right information at the right time to the right person continuously and directly, all the system components are designed and implemented for asynchronous (Store-forward) operation as well as synchronous for the highest resilience.

Since Integrated Healthcare Management Information System (IHMIS) is a holistic system primarily developed for forthcoming healthcare providers. IHMIS is a total system comprehending:

- End-to-end collaboration of primary, secondary and academic healthcare units upon standardized clinical and administrative Hospital Information System (HIS) workflows and business processes.
- Utilization of centralized framework using common Master Plan Index and Electronic Health Records databases.
- Empowerment of medical diagnosis and treatment systems with state-of-art Medical Ontologies, Classification and Coding Corpus.
- Co-execution with a centralized and Coding Corpus.
- Elevated point-of-interest decision support and in-depth OLAP analyses designed for different command levels.
- Centralized system administration and control functions warranting rapid, remote and scalable installation.

[20] Contribution: Arikan Dalkilic, Turk Telekom Group, Turkey. See document SG02-INF-0058

Figure 13: Integrated Healthcare Management Information System (IHMIS)



IHMIS infrastructure designed upon core technological components listed below:

- Medical Data Dictionary: Enterprise Medical Data Dictionary, a specific database, has an information model that will be the guide for forming an electronic patient record. Medical Data Dictionary will be an information system that will consist of a controlled medical vocabulary including third party coding systems such as ICD-10, CPT and SNOMED, a semantic tool that makes possible to establish semantic relations between medical concepts and a database.
- Clinical Data Repository: In order to create life-time electronic patient record, Enterprise Clinical Data Repository(CDR) will be developed which will support problem-oriented medical record structure and will become a central database that the physicians could reach at the point care, analyze data, input data. CDR will be developed as complying with ASTM and HL7 standards.
- Master Patient Index System: Enterprise Master Patient Index (MPR) will be developed in order to describe patient patients' (?) apply to one of the institution' rapidly and correctly. Enterprise MPR will integrate about patients' demographic and their applications will be obtained centrally and summarized.
- Clinical Workstation Application Software: An easy to learn and user friendly interface will be developed that allows users to reach previous records (if any) of inpatients and outpatients. The user interface having open system characteristics will be developed via utilizing CCOW (Clinical Context Object Workgroup) standards and components as DCOM, COM+, etc., XML technologies.
- Enterprise Registration System(ERS): will provide unique solution for executing all record processes of all related departments according to the Enterprise workflow, ERS will be developed as complying with ASTM and HL7 RADT(registration, administration, discharge, transfer) standards and Enterprise MPR will be a part of ERS applications. ERS will also include an appointment system that allows programming institutions, medical sources and patients' time.
- Case-Mix Classification Systems: Standard data sets will be created for inpatient and outpatient in order to be able to evaluate healthcare quality and costs and deliver internationally comparable information.
- Data Entry Tools: One of the main principles in creating electronic patient record is to guarantee entering structured and coded data of the electronic patient records. By using enterprise medical data dictionary; will be developed natural language processing tools for structured and coded data entry from free medical texts in electronic environment and dynamic data entry tools for directly structured and coded data entry.
- Enterprise Object Oriented Workflow Platform: will be developed in order to make it possible to set relations possible to set relations between Enterprise EPRS and enterprise resources such as

healthcare personnel, medical units and medical equipment, work according to the enterprise workflow and exchange data institution's other information systems. Enterprise Object Oriented Workflow Platform; will include a flexible and adaptable modelling tool that will make possible to model enterprise sources and workflows and a messaging interface with HL7 standard to provide data exchange between other health information systems such as hospital information system(HIS) of Enterprise EPRS in institution, laboratory information system(RIS), radiology information system(LIS).

Successful Case Analysis: Turkish Armed Forces and IHMIS

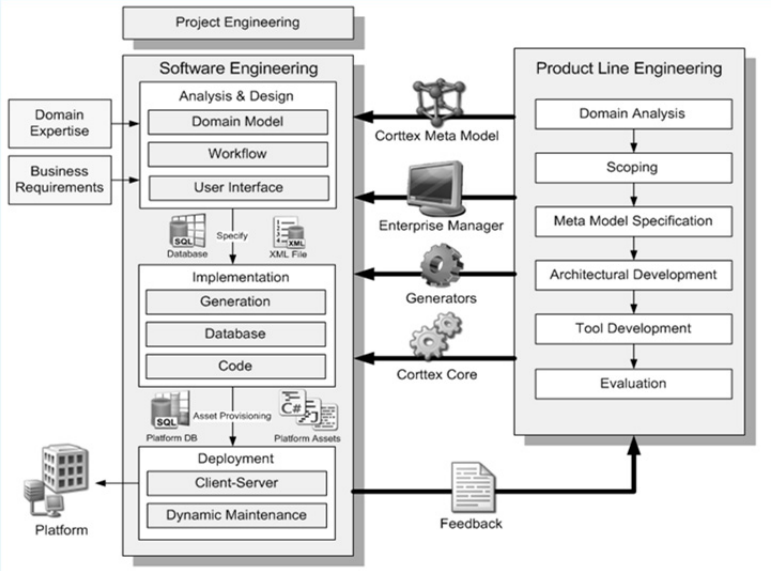
Turkish Armed Forces (TAF) has used the Integrated Healthcare Management Information System (IHMIS) for more than 10 years. TAF IHMIS covers whole country, 3 academic level and 44 secondary level hospitals, and served over 2,5 million people. TAF IHMIS is the second largest national healthcare system of Turkey, after Ministry of Health hospitals.

TAF IHMIS holds and executes total capabilities of a healthcare system including essential medical processes, military healthcare logistics and public reimbursement regime. TAF IHMIS is a globally unique project not only due to its extended capabilities but also its technological pillars. TAF IHMIS, is almost one of the successful projects throughout the world employing longitudinal electronic health records (EHR). TAF IHMIS ensures lifetime health records of personnel accessible under patient privacy and safety legislation. TAF IHMIS executes an end-to-end healthcare logistics workflow which is traceable from procurement till terminal point-of-use. In financial terms TAF IHMIS manages a healthcare service approximately two billion dollars per year. TAF IHMIS project is accepted as a backbone system for TAF military requirements, namely progressing towards mission area mobility and interoperability.

TEPE Technological Services, as a total solution provider supports its clientele with an implementation methodology. An illustrated development and deployment methodology of TEPE is given below.

The methodology encompasses hand-to-hand execution of project engineering and product line engineering. Since IHMIS is an enterprise management platform is stretch, primary step of the implementation starts with domain analysis. Domain analysis step ensures proper and in-depth analysis of client requirements. The analysis also covers workflow and user interface requirements. The logical design of the tailored solution accordance with the client requirements are supported by domain expertise and whole perspective of business requirements. The outcome of domain analysis is converted into initial system implementation. The implementation steps were shown in Figure 14.

Figure 14 Deployment methodology of TEPE



The initial implementation is the transition phase before full scale implementation and covers all preliminary setup of databases, preset user interfaces and roles/privileges that is adapted to user environment. Over the initial implementation, the software bundle customized with respect to client workflows, additional development were accomplished and finally the final system design is made to ready for integration tests. Integration tests were conducted with simulated yet full scale data sets plus, integration of medical devices and other third party solutions. After the successful integration tests, the system deployed to client production environment and data migration tasks finished. With the ultimate performance tuning, the system is accounted as available to go-live phase.

About Tepe Technologies:

TEPE is an innovator and leading company that produces and invests real national technologies, has a place in international information technology market, produces and shares information and sets standards, is perceived as a brand, is being consulted and its solutions are taken as a reference in the field of health informatics and workflow systems.

TEPE Technological Services designs and delivers applications on internationally acknowledged health informatics standards since 1993. Company:

- Produces information technology solution to provide the information management requirements of institutions in all levels and make them work in more efficient, qualified and productive manner.
- Develops information systems that deliver the right information to the right person at the right time and in the right level.
- Delivers information systems that determine working manner of the customers and cause measurability of works, in the field of production, development, implementation and integration of information technologies.

1.16.2 Case 2: The Application of Central Hospital Appointment System (CHAS)

Generally, the main problems of developing countries, like Turkey, are the financial problem and lack of the specialist doctors. Moreover developing countries face with the challenge of using existence resource in effectively.

The project which was designed by the cooperation of the Turkish Ministry of Health and Turk Telekom can be good example for developing countries common problems. We believe that the project Central Hospital Appointment System (CHAS) must be assessed in the ITU's platform.

What is the CHAS?

CHAS is a kind of service that helps citizen for make an appointment for the health centres according to needs of the citizens.

Firstly, citizens must call the number 182 in order to benefit from this system. The alive operator will answer the call. The main purpose of the call centre is to direct the citizen to the most suitable health centre. Of course, citizen can declare his/her demand about the name of hospital and the name of the doctor. Call Centres try to help the citizen to realize his request. However, if citizen's request is not suitable in the selected time slot, call centre can direct the citizens another health centre. Moreover, Operator must interest the problem of the citizen intimately. If first aid information is needed, Operator can help; also during emergency situation Operator can inform emergency teams like ambulance etc.

The citizens also benefit from the number 182 by expressing their concerns and their complaints about the health services. Operators interst and note the complaints, and they send their notes to the relevant division of the Health Ministry.

Basically, how does it work?

1) In order to benefit from the services, the citizen must call the number 182. The citizen can use either fixed or mobile phones.
2) The alive operator will answer the call. The citizen must share his/her identity number by operator for acceptance of request.
3) Citizen declares to operator to which hospital he wants to go and which doctor he wants to contact.
4) Operator checks the agenda of the relevant hospital and relevant doctor.
5) Operator informs the citizen about the available time slot.
6) If the appointment date is not suitable for citizen, Operator can suggest alternative time slot.
7) After the agreement, the talk is finished.
8) Citizen must be in hospital 30 minutes before the appointment time and Citizen must make registration at the hospital.
9) Citizen can cancel the appointment time with by 182 thereafter.

CHAS system has 4 main processes:

- Main Process 1: Processing the appointment request
  - After calling number 182, the citizen must give his/her identity number.
  - After the endorsement of the identity number of citizen, the appointment is approved by the Operator.
  - If Citizens doesn't know his/her identity number, Citizen must share his/her identity information with operators.
- Main Process 2: Cancellation of Appointment (by Citizen)
  - If the citizen wants to cancel the appointment, she/he must declare his/her identity number or information by calling the number 182 again.
- Main Process 3: Cancellation of Appointment (by Doctor)
  - If the Doctor has some urgent work to do, appointment can be cancelled.

- Patients are called by the operators
- New Appointment time is offered.

- Main Process 4: The Pursuit Of Appointment
  - Operator also controls all appointments day by day.
  - After the appointment time, Operators call the citizens who benefit from CHAS
  - The purpose of this call is to learn the view of the citizen about CHAS services, if there are important complaints; the complaints are recorded than the results sent to Center of the Minister of Health.
  - Moreover, Surveys are applied by the operators.

General Survey Question:

- Did you examine in the appointment time?
- Did your doctor examine you in the appointment time?
- If another doctor examined you, how they explained this situation?
- In general, how many points you give CHAS? (1=minimum, 5=maximum)

Figure 15: Example of CHAS survey

Participants in the Survey (MAY 2010)

Citizens Who	Number	%
Participate	4013	65%
Don't participate	2197	35%

Obeying the Appointment time by Hospital (MAY 2010)

Doctor is	Number	Percentage
On Time	3513	88%
10-19 minutes of waiting	369	9%
More than 20 minutes	131	3%

Few Solution of Question

The organization chart of Hospitals for CHAS

The main responsibility of Hospital is to organize the CHAS system properly. Each Hospital employees must work for the success of the CHAS.

The assistant head of hospital is the main responsible for the project. She/he must prepare the working agendas of each doctor in the hospitals. The agendas must be approved by head of hospital.

Responsible of Working Agenda controls the fulfillment of the all working agendas.

Responsible of CHRS Software deals with technical aspect of project.

Reception Employee must welcome the citizen and they must answer all questions of the citizens.

The Duty of Doctors

- Hospitals must prepare each doctor's working agenda for every month,
- Doctor must accept and sign the conditions of working agenda for every month,
- Doctor must obey the conditions of the working agenda properly.

- Doctor may not be in holiday during process.
- Doctor can cancel the appointment only if acceptable urgent conditions are occurred.
- Working agendas of Doctors is controlled by the assistant Head of Hospital.
- The purposes of CHAS Projects are the following:
- To increase the efficiency and the quality of health services which are given by Turkish Health Ministry.
- To increase the public satisfaction about health services.
- To compose the limited resources allocation (the usage of the man power and equipment).
- To decrease the crowd density in the hospitals.
- CHAS will also help for equal services rights of the people. With this system, people will access to the equal health services.
- The health workers will work more efficiently.

Figure 16: Example of CHAS or doctors

Doctor who obeys the appointment time

(MAY 2010)

Doctor	Number	Percentage
obeys appointment time	3852	96%
doesn't obey appointment time	161	4%
Total	4013	100%

The Cause of Doctors who are not on time the appointment time

Doctor was	Number	Percentage
On Vacation	48	31%
In Surgical Operation	25	16%
In Different Department	13	8%
In Lunch	5	3%
Unknown	65	42%

How many points you can give for CHAS?

Point	No of People	%
5	3206	80%
4	544	12%
3	178	6%
2	48	1%
1	37	1%
Total	4013	100%

Did you experience a problem with call center?

Answer	Number	Percentage
No	3963	99%
Yes	50	1%

Some years later, the data which will be obtained by CHAS sources can be used for reshaping the Health Policy of Country.

Propagation of CHAS project

A CHAS service firstly was started in Erzurum and Kayseri cities in February 2010. These cities are among medium sized cities of Turkey. After that, the services were propagated 10 other cities of country on summer 2010. Those cities are chosen from different geographical part of the Turkey.

The Support of Turk Telekom

In 19 August 2009, Turk Telekom and Minister of Health signed the cooperation agreement. According to the agreement, Turk Telekom accepted very critical commitment.

For realizing this project, Turk Telekom finances all technological and human resources infrastructure. Turk Telekom employed 150 operators in Call Centre which is situated in Erzurum.

Moreover, Turk Telekom increased the capacity and the scope of the existence telecommunication infrastructure of Turkish Ministry of Health. Almost all Turkish Hospitals have broad band Internet connection.

Today, Turk Telekom implements CHAS project in the 10 different cities of Turkey. However, the duration of the agreement which signed between Turk Telekom and Ministry of Health will finish at the end of the 2010.

Ministry of Health wants to propagate the scope the CHAS services to 81 cities of Turkey. Therefore, Ministry will invite tenders for the render of CHAS services in all 81 cities of Turkey. Turk Telekom is also candidate for the new period.

Conclusion

CHAS is very important part for the transformation process of the Health Sector of Turkey. If Turkey increases the scope of the CHAS to the all cities of Country properly, total efficiency of health sector will be higher and the crowd in the hospitals will be decreased and the hospitals will be better places for working comfortably.

1.16.3 Case 3: Acibadem Mobile Emergency Health Bundle Services

Introduction

[21]In order to develop the national e-Health policy, the creation of a national strategy is critical. Governments must work to implement the e-Health policy. During the creating of a national e-Health policy, the support of the private companies is needed. Especially, according to World Trade Organization (WTO) Agreements, many countries privatized their incumbent companies and they created the competitive market in the telecommunication sector. Moreover, in health sector, many private hospitals worked with public hospitals. The governments must support the cooperation between telecommunication companies and hospitals in terms of regulation. The incentive of the government leads to very efficient cooperation between the health and the telecommunication sectors. The e-Health Master Plans must contain the financial and regulative incentives for sectoral cooperation.

In this document, the cooperation between Turk Telekom (incumbent private telecommunication operator) and Acibadem Hospital (Private Hospital Groups) is shared.

Stakeholders

Turk Telekom is the leading communications and technology company in Turkey with a $14.5B market cap. Also:

- Strong consumer base: 16.3 M fixed voice, 6.5 M broadband, 11.5 M mobile subscribers.
- Extensive service and distribution networks: access to 2.5 K corporate, 179 K SME, 1.5 M SOHO accounts with 1K+ dealers.
- Diversified portfolio of businesses; owns verticals such as education & online games.

[21] See document SG02-INF-0056

- Operates digital platforms: IPTV, WebTV and mobilTV.
- Ability to attract high caliber technical human capital in Turkey (in recent year, out of 100K applicants, recruited 5K+ mainly technical people).
- Strong ties with regional telecommunications operators: access to a large population base.
- Strong financials & willingness to invest for high growth areas.

Acibadem Healthcare Group has been providing its services through its 24 branches spread all over the country with it's over 7.000 employees, 1.350 of whom are physicians since 1991.

On the other hand, Acibadem Mobile Healthcare Services Inc. was established in July 2008, as a partnership between Acibadem Hospitals Inc. (80%) and Acibadem Polyclinics Inc. (20%).

Company's Goal

Acibadem Mobile Healthcare Services aims to provide mobile healthcare services at the highest quality level possible, in line with the mission, vision and quality policies of Acibadem Healthcare Group, which was selected as the "Most Valuable Brand" of Turkish healthcare sector in 2007.

Medical Team

With its over 300 employees, over 100 of whom are physicians as of the end of year 2008, Acibadem Mobile Healthcare Services provides mobile healthcare services to individuals and entities with its leading edge mobile medicine technology.

Definition of Services

The service is called Turk Telekom Acibadem Mobile Health Services (TAMHS). The TAMHS was created by the cooperation between Acibadem Hospital and Turk Telekom. The TAMHS which is the bundled service includes different services: Emergency Health Insurance, Medical Coaching, Emergency Healthcare Services (Land and Air Ambulances), Home Care Services, Resident Infirmary Solutions, Mobile Healthcare Screening, Organizations (Providing mobile healthcare services for various events), Telemedicine (Remote access online healthcare service), Affinity (Group) Programs.

The bundled services are provided by the Acibadem Hospital Staff for 16 million Turk Telekom Customers. The customers who benefits from the bundled health services, pay their fee with Turk Telekom invoices.

Purpose

Turk Telekom offers this beneficial bundled health services with very suitable conditions to the millions of people. Because of the -economies of scope advantages, these important services can be provided very cheap conditions for each customers of Turk Telekom.

Besides, the number of fixed subscriber decreases day by day in all worlds of fixed markets. The health services can be very good opportunities for increased loyalty of the customers.

The Main Characteristics of the Services

For 1 year, Turk Telekom customers can benefit from TAMHS in 7 days 24 hours.

With AHMS;

- Customer can be informed about pharmacy on duty.
- Health consultation services.
- For subscriber and his family (max. 3 people), a free fully equipped ambulance service.
- For subscriber and his family (max. 3 people), a free 1 year health insurance.

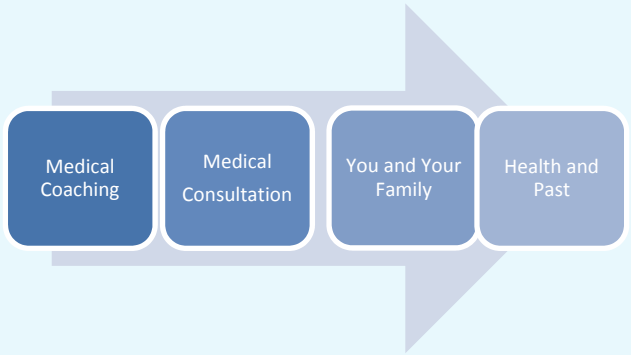
The subscriber and his family's health reports and talks are stored with property rules. Those data can be used again in further health problems. The health insurance is valid in all private hospitals in Turkey. Insurance includes all charges related with treatment, room and intensive care. The charges couldn't be exceeding approximately 4000 U.S. dollars. If the subscriber has insurance, it is not a barrier for benefit from AMHS.

Target Audience – All Turk Telekom subscribers and their family (max. 3 people, until 65 years of age)

Application Requirements

- All Turk Telekom PSTN subscribers can benefit from the health services
- Subscribers must be already Turk Telekom user for at least 2 months (60 days).
- Subscribers, who benefit from these services, can also benefit from other Turk Telekom services.
- Customer must accept to be subscriber of Turk Telekom for the following 12 months.

Figure 17: Turk Telekom Acıbadem Mobile Emergency Health Bundled Services (AMES)



Turk Telekom Acıbadem Mobile Emergency Health Bundled Services

AMES includes 4 different parts.

Medical Coaching

For 1 year, Turk Telekom customers can benefit from TAMHS in 7 days 24 hours.

Medical Consultation.

Customer can be informed about pharmacy on duty and other important information for free.

You and Your Family

In emergency situations, subscribers and their family can benefit from a free fully equipped ambulance service and a free 1 year health insurance.

The subscriber and his family can benefit from all advantages in all parts of country.

Health and Past

The subscriber and his family's health reports and talks are stored with property rules. Those data can be used and shared in further health problems.

How Customer Can Apply To The Services?

- Call Center

The Customer can apply to the campaign by using Turk Telekom Call Center.

- Turk Telekom Office

The Customer can apply the campaign by signing application forms in Turk Telekom offices.

Conclusion

Technological improvements contribute to the development for the new medical solution. Besides, Information and Communication Technologies are very important for spreading health services efficiently in the country. Especially, mobile broadband technologies serve new opportunities for the health sector.

Governments must support all e-Health investment in their countries. Governments must create economic incentives to create suitable environment between Health and Telecommunication sector.

The cooperation between Turk Telekom and Acibadem Hospital can be a good example for the competition environment. This cooperation serves very suitable bundled health services to the customers. The bundled service includes health insurance, first aid, family health opportunities in the same time.

The convergence between health and telecommunication sector can produce very successful solutions. International Telecommunication Union (ITU) must work for creating the right incentives between these two different sectors.

1.17 Uganda: Uganda's Approach to Implementing Broadband Connectivity in Underserved Areas

1.17.1 Introduction

[22]Uganda Communications Commission (UCC) established the Rural Communications Development Fund (RCDF) to stimulate provision of telecommunications services in the rural and underserved areas. The RCDF is therefore acts as a mechanism for leveraging investments in communications infrastructure and services in rural underserved areas of the country. This was recognition of the fact that although the sector had been liberalized and opened to competition some parts of the country which were non-commercially viable would not attract private capital for investment in infrastructure and services.

The RCDF main objectives include to provide access to basic communication services within a reasonable distance; ensure effective investment in rural communications development and to promote ICT usage in Uganda.

1.17.2 Uganda's Universal Access Policy Framework

Uganda's Universal Access Policy (2010) is developed within the premise of the global development agenda, the Millennium Development Goals (MDGs), to which Uganda is one of the signatories; and its country-specific National Development Plan (2010) that was originally linked to the national vision called Vision 2025. The policy is also developed building on the previous universal access policy (2001) and within the framework of Uganda's ICT policy and telecommunications policy.

Objective

One of the main reasons why the Internet has not spread to the rural areas are the cost of access, insufficient bandwidth and power issues and more important for the rural communities, illiteracy and the absence of relevant local content in vernacular. The new policy therefore has the main objective of ensuring provision of broadband connectivity and supporting the development of local content. However, the main impediment for the ICT sector in Uganda today is the lack of broadband infrastructure network

[22] Contribution: Moses Okello, Uganda Communications Commission (UCC), Uganda. See document SG01-INF-0017

meant to accelerate access and use of the Internet in particular and ICTs in general. This is especially because of the heavy capital requirements that cannot be left to the private sector alone and thus requiring special intervention from government.

Broadband Policy Implementation

Uganda government has embarked on supporting the interconnection of all higher local governments' capitals and major towns with a national data backbone infrastructure so as to enable provision of wide array cost effective ICT services to the users. This expected to facilitate the establishment of institutional data access points with initial focus on vocational, tertiary and secondary educational institutions, and government health units for levels IV and III.

Broadband connectivity will be provided for selected sub-counties to connect to the high speed National Backbone Infrastructure. The connection is considered as a 'last mile' solution for the sub-counties. To this end, a detailed study to determine the most cost effective technological solutions (wireless, cable) that could be implemented for each location is underway. Additionally, the study will help in identifying the districts that will not be covered by the national backbone infrastructure. The backhaul links will then be deployed to link such sub-counties to the identified districts.

The initial proposal is to outsource the design and implementation of the proposed access network to competent telecommunications service providers. The project once implemented is intended at lowering the price of bandwidth paid by the consumers while providing high quality and a wide variety of broadband services. The project will also entail providing computers and capacity building or training programmes to the end users such as schools, health centres and local governments.

1.17.3 Expected Benefits

- E-government: The project will help in collecting information from lower local governments upwards to the central government. The information will be part and parcel of the national demographics and other socio-economic related statistics.
- E-education: The project will facilitate e-learning and already this is gaining popularity in the country. For example major local universities are having satellite campuses in upcountry locations in which long distance and online education are now being offered.
- E-health: The project will facilitate data and voice flow from the rural communities to the health centre onwards to the district hospitals and regional referral hospitals and finally to the national referral hospital. The reverse flow will happen. Additional traffic is expected between the Ministry of Health head office and the district offices and also between the ministry and the health centres.

1.17.4 Conclusions

Internet penetration, access and usage in Uganda is still very low and is estimated at (5%) users of the total population. This is also largely confined to urban commercial centres owing to commercial considerations by the private service providers. Although Uganda's previous policy had supported the installation of Internet points of presence in all the underserved districts, the internet bandwidth speeds and quality of service issues (outages) has been of major concern by the end users.

Therefore the new policy objective is expected improve broadband uptake in selected underserved areas. This is envisaged offer lessons and experiences for developing a national broadband policy and subsequent rollout strategies for the country. Therefore ITU-D Study Group meetings offers Uganda an opportunity to gain experiences on how other countries are addressing this developmental concern.

1.18 Uzbekistan: Health Management Information System in Uzbekistan

[23]Currently in Uzbekistan a wide range of socially significant reforms are carried out. There are the administrative reform, education and health care reforms, etc. Much attention is also paid to the development of information technologies – informatization of state agencies and set up the ground for future e-Government in the near future.

To speed up the introduction, use and further development of computer information systems, the program of computerization and ICT development in 2002 – 2010 has been adopted by the Government of Uzbekistan. The program was designed to create conditions that will allow Uzbekistan to achieve a higher level of ICT penetration in all spheres of life, including public administration and social activities.

1.18.1 HMIS in Uzbekistan

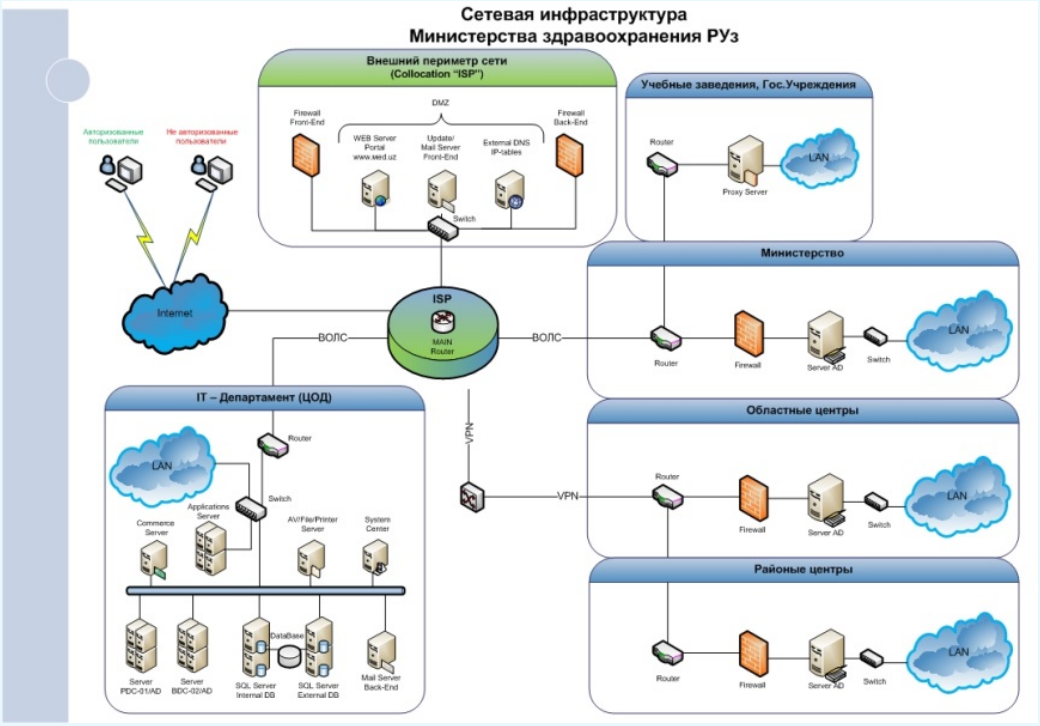
Integrated Health Management Information System means a multi-tiered system consisting of software and hardware in departments and divisions of the Ministry of Health, medical institutions, laboratories, sanitary-epidemiological surveillance departments, research institutes and universities as well as in departments/units of medical statistics. The development of the Health Management Information System should be based on the use of Internet technologies and integration of all available information resources into a single corporate network of the Ministry of Health.

The Ministry of Health approved the concept of HMIS (Decree №99, March 31, 2009) after detailed considerations and evaluations. It was selected a star type architecture of HMIS with the Data Center located in Tashkent based on open integration-communication platform. The structure of HMIS is presented in Figure 18. The decision to select the centralized architecture was well justified at this moment because the environment is not well prepared for computerization and it is needed some control. The Healthcare Integrated Platform is the common telecommunication and information infrastructure and it is a backbone of HMIS. It will be built component-wise, mutually connecting all entities into powerful common infrastructure. Of course, each entity has its own Local Area Network (LAN). This approach also allows adding or subtracting any component as appropriate and needed. It is important to stress that one of the main advantage of such architecture is scalability.

The all organizations belong to the Ministry of Health will transmit their information according to the agreed protocol directly to the Data Processing Center which is the repository of all information of the Ministry. The Data Center will be connected with all information systems and databases such as “Management and planning of human resources of health care system”, “Monitoring of infectious diseases”, “Basic register of blood donors and persons not permitted to donate”, “E-passport of health facilities”, etc.

[23] Contribution: Mirodil Baymukhamedov, Ministry of Health, Uzbekistan. See document SG02-INF-0039

Figure 18: Architecture of HMIS in Uzbekistan



Openness and standard pursuance of selected HMIS architecture enables interconnection of any other kind of register or database that healthcare service process requires. Furthermore, central system management reduces administrative costs.

The Data Center will get raw data without any intermediate levels and process it into required format, presentation or report. Data Processing Center (DPC) of Ministry of Health, which will be the heart of the HMIS should also include a Service Center and Call Handling, which is a standard feature of any data center. The access to the information will be restricted and regulated.

The advantages of this architecture are the following:

- Direct transmission of primary information in the database eliminates the possibility of modifying the original raw data.
- Instant display information in real time by any criteria.
- A single data repository eliminates duplication.
- Paperless process will bring some saving.
- Only the owner of raw data has a right to make correction of his presentation.
- Manager will get a chance to view the situation at any time.
- Quick search of any information related any region & Sampling only interest criteria.
- Universal access via the Internet (Intranet) in the presence of access rights.
- Complete elimination of middlemen, who collect and aggregate data.
- High level of security.
- Opportunity to get quickly any analytical or statistical reports.

1.18.2 Activities Undertaken by the Ministry of Health

In line with the approved HMIS concept and according to available resources, the Ministry of Health is providing the number of servers and computers to organizations in order to connect them to corporative information network.

The Ministry of Health decided to establish a database and distribution of computer equipment based on the concept adopted, with phasing for connection of each organization to the corporate network of the Ministry. The introduction of some e-Health services is considering as well.

The main objective of e-Health services is to provide expert medical help to the people situated in rural and remote areas where highly qualified and experienced doctors are not available. Improvements in all aspects of information and telecommunication technologies are enabling health and healthcare organizations to share information electronically across previously impossible distances and borders, and bring clinical practice and administrations alike to the healthcare staff in any location. New technologies are emerging and rapidly maturing. In some cases even faster than users can absorb and integrate them.

The introduction of the telecardiology monitoring service (and other e-Health services) will give the opportunity to provide quick and highly needed service at a distance for many patients suffering from cardio-vascular and other chronic diseases.

1.19 Zambia: Project MWANA

[24]Project Mwana is one of e-Government service that Ministry of Health has implemented with the help of the cooperating partners to improve early infant diagnostics services, post-natal follow up and care using mobile phones.

1.19.1 Country Overview

Zambia has shown growth in attracting investment in the Information and Communication Technologies (ICT), Sector. The sector has recorded over 42 percent penetration rate growth compared to 0.02 percent recorded 14 years ago. The ICT sector have continued to pour in since the country launched the policy in 2007 adding that the policy has created an environment for the growth of the sector. Mobile manufacturing company and various internet and mobile service providers are some of the investments that the country has attracted. The unfortunate scenario is that most of development are concentrated along the line of rail, leaving large areas in the rural and remote place unserviced or underserved.

In Zambia, large numbers of infants are infected with HIV either at delivery or when breastfeeding. If no interventions provided, most of these children who contract HIV from their mothers die before the age of two years. These deaths contribute to the high levels of national under-five mortality rate. The government made it mandatory to test every infant born and begin treatment within the first twelve weeks of life.

The challenge faced by the Ministry of Health in particular area was how to transmit infant diagnostics services results from the three (03) test centres (Laboratories) in the country to the respective remote places within the shortest possible time. The turn-around time under the courier systems available would take an average duration of forty-two (42) days to complete the process, a period too long for a mother wait without breastfeeding. This challenge led to the birth of Project Mwana in 2009.

[24] Contribution: Beaton Sibulowa, Ministry of Transport, Works, Supply and Communication, Zambia. See document SG02-C-0215

Objectives and Strategies:

- To strengthen early infant diagnosis with an aim both to increase the number of mothers receiving results and to reach mothers in a faster, more efficient manner using the SMS application (m-Health).
- To improve the rate of postnatal follow-up, increasing the number of birth registrations for clinic and community births, while also raising the number of clinic visits for mothers through community-health worker tracing using the "RemindMi" application.
- To enhance service delivery of government to its citizens.
- To reduce bureaucracy, turn-around time in providing government services.

Activities Implemented:

- Procurement of ICT Infrastructure (Servers and Connectivity) for the project.
- Development of Project Mwana using RapidSMS, a free and open-source framework for building mobile application for dynamic data collection, logistics coordination and communication, leveraging the basic short message service mobile technology.
- Piloted in the project 6 provinces across Zambia, servicing 31 clinics and the pilot evaluation showed that it had substantial positive health impacts.
- Scaling the project nationally between 2011–2015.

Technologies and Solutions Deployed:

- SMS technology – powerful innovation that in Zambia has reduced delays in receiving early infant diagnosis (EID) DBS HIV test results, improved communication among health care providers and community volunteers, and more important, encouraged patients to return to the clinic for their test results with greater confidence.
- RapidSMS Technology – addresses Early Infant Diagnosis (EID) of HIV. SMS messages are used to send the HIV results from the labs where they are processed to clinic workers in facilities where the samples are collected. The results arrive on phones in smaller clinics and SMS printers in larger facilities. The system also tracks samples and provides real-time monitoring for the province and district officials.
- RemindMI RemindMi addresses Patient Tracing for post-natal care. SMS messages are sent to Community Based Agents who seek out caregivers and infants and ask them to return to the clinic for 6 day, 6 week and 6-month post-natal check-ups or special circumstances, such as results arriving at the facility.

Changes and Outcomes Achieved

Project Mwana RapidSMS pilot reduced delays in transmitting results from the HIV test laboratories to the rural health facilities via SMS message from the average of 42 days to an average of 4 days. To date, the project has been piloted in 31 predominantly rural districts of Zambia and has produced desired results, which has prompted the government to schedule a national scale up program.

1.19.2 Challenges and Success Factors

Challenges:

- Ownership of the project prior to initiation, and coordination among the partners.
- Sustainability of the project after scale up and when cooperating partners hands over the project totally to government.

- Lack of investment in research and development in ICT.
- Digital gap between the Urban and the rural areas.
- Socio-economic disparitie.

Success Factors:

- Leadership taken by government on the project & Government beginning to fund the large component of the project

1.19.3 Lessons Learned and Next Steps

- Government leadership
  - When undertaking a project in the government, Users should be involved from the beginning project. This step helps in understanding user requirements and processes involved to complete tasks.
  - There is need to integrate the project into long-term planning.
  - Integrate data into district reporting.
- Locally sourcing – Employ a permanent local software development team; Have a permanent project manager who can coordinate partners; Create government-led working groups.
- Cost control
  - Negotiate with telecom companies for scale, not pilots.
  - Utilize the phones people have rather than purchasing and supporting a national phone system.
  - Create district-level training teams.
- Co-creation
  - Make decisions based on identified needs of the end users.
  - Create the tools with the people who are going to use them.
  - Test early and often; don’t worry about failing and stay adaptable.
  - Use open source tools that can be customized to local needs.

1.19.4 Next Steps

A national scale-up plan has been developed, commencing with a preparation phase and then shifting to an iterative phase where clinics are trained and added to the system and the problems and successes of the additions are evaluated. The aim is to achieve national scale by 2015, with health facilities offering early infant diagnosis services. The preparation phase will focus on solidifying the technical, physical, monitoring and human infrastructure to allow the system to handle the stresses of scale. Throughout the scale-up process, the project will be closely monitored to ensure the systems are having a positive effect on the targeted health challenges.

Annex II: Lessons Learned from e-Health Implementation: Knowledge

The following examples of strategies and implementation of e-Health services and devices were cordially provided by members of ITU-D Study Group 2 Question 14-3/2.

2.1 Czech Republic: 1. Interoperability in Integrated Biomedical Systems

[1]Our work on biomedical research projects has led us to the conclusion that successful integration of partial solutions is strongly dependent on the issue of interoperability of medical devices and information systems. It comprises problems of standardization of data acquisition, communication, processing, and storage; and connected problem: correct data mapping between different ICT applications. The key issue is the ability to understand the semantic content of the exchanged information.

With development of more advanced sensors, body area networks and ICT the focus will be on the integration in larger systems collecting and processing large volumes of data, evaluating more complex situations and scenarios, precise identification of potentially dangerous situations and finding solutions (e.g. alarms in case of health or life threatening events, access blocking in case of security attack). Key issue is in information reporting and visualization (as widely used in Business reporting). Although many issues have been successfully solved and introduced either in applied research or in development of prototypes or final products there are still many problems on the waiting list. There is a possibility to use an integration platform; however the systems should be able to communicate directly using world-wide recognized standards without third party.

2.1.1 Technological Trends

If we want to develop flexible e-Health, assistive technology (AT) or ambient assisted living (AAL) systems we have to define standard interface that allows “plug-and-play” type of connection. Especially AT and AAL systems are composed of different hardware and software modules that must communicate. The basic condition is that the receiver understands correctly the content of the message. Thus it is not sufficient to be able to receive the message, i.e. to understand the syntax of the message, but it is necessary to understand the semantics. This requirement implies development of data model that maps semantic content from the data received from the devices into an information system that is usually used for collecting and evaluating data from monitored persons. Also there must be guaranteed latency of the information transition and a possibility to verify the source of the message (for example by PKI infrastructure) and to clearly determine the time order of messages. We propose a system architecture allowing above mentioned interoperability. Interoperability may significantly influence effectiveness both of design and development of an integrated system and of its routine operation.

Integrating information deriving from different sources and implementing it with knowledge discovery techniques allows medical and social actions to be appropriately performed with reliable information, in order to improve quality of life of patients and care-givers.

Currently the mobile technologies, sensors and other devices enable collecting vast amount of data of individuals. This multi-parametric data may include physiological measurements, genetic data, medical images, laboratory examinations, and other measurements related to a person's activity, lifestyle and surrounding environment. There will be increased demand on processing and interpreting such data for accurate alerting and signalling of risks and for supporting healthcare professionals in their decision making, informing family members, and the person himself/herself.

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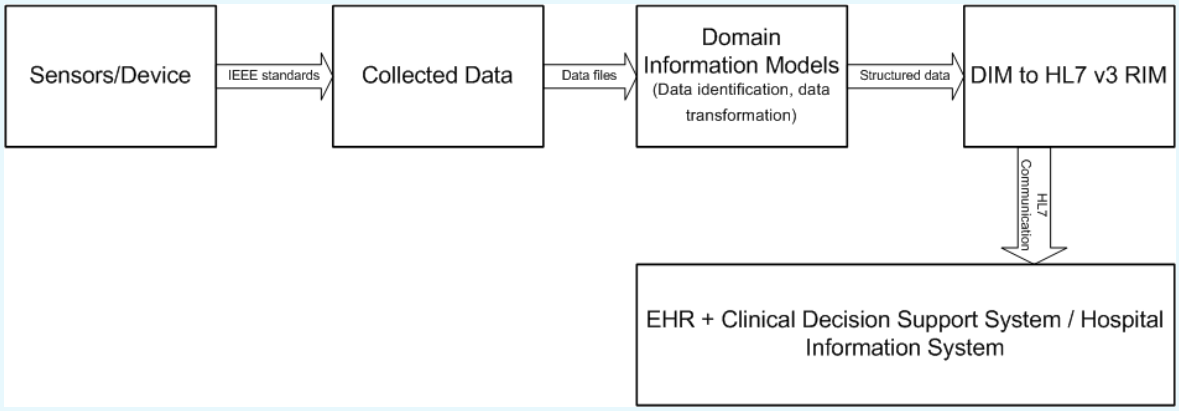
[1] L. Lhotska (1, 2), M. Bursa (2), and M. Huptych (2) [1] Czech Society for Biomedical Engineering and Medical Informatics & [2] Czech Technical University in Prague, Department of Cybernetics, Czech republic. See document RGQ14.3.2-C-0014

Recent development in ICT [1] [2] shows that it is almost impossible to design and implement a complex system as fixed to certain hardware, operating system, and infrastructure. A possible solution is to create a tiered integration platform. However it is usually ineffective and expensive (to create and maintain). Thus it is necessary to develop such architectures that will be easily extensible and modifiable. For easy extensibility the basic requirement is to understand data exchanged between individual parts of the system.

2.1.2 Proposed Architecture

Based on the facts mentioned above we have tried to define requirements and subsequently system architecture that would satisfy these requirements. The proposed architecture [3] covers the whole chain from data acquisition/measurement over data collection, identification, transformation up to evaluation and storage in an EHR system (see Figure 19). From the description it follows that there must be interfaces between individual modules. To allow the "plug-and-play" approach the interfaces must be.

Figure 19: Proposed architecture of the chain from medical devices to EHR and HIS



Based on well-defined standards, we have in mind especially following categories: ISO units for measurement of physical quantities, ISO IEEE standards in communication, standard file formats in software area, HL7 standards on the side of information systems and guarantee data accessibility even after long time when there would be data for long-term clinical studies. Another inseparable part of the architecture is constituted by data models. The models will ensure correct exchange of data between devices and information systems. This part represents a great challenge and at the same time the greatest space for future solutions because the correct mapping of acquired data onto a data model that describes electronic health/patient record is not satisfactorily solved yet. A crucial part is to select proper backend solution (such as information systems, databases, platform, etc.). The architecture must also keep pace with the versioning of the information models. Each batch of data must reference the version of information model that was active at the moment the data was acquired and the model must be available together with the archived data.

The proposed architecture is not necessarily centralized. It can be composed of highly distributed units utilizing, for example, multi-agent platforms as software infrastructure [4]. For example, it can be used for more efficient data handling. For data storage there can be smaller local storages and a central data storage used for different types of data. Also replicated and/or distributed storage can be used. Since there can be collected health state data and daily activities patterns the large volumes of data can be stored locally and based on the data analysis during system development the professionals (e.g. medical doctors) can define, which type of data should be sent to a central data storage maintaining electronic health care records.

2.1.3 Current State in Czech Republic

Legislation

The state of interoperability in biomedical systems is strongly influenced by legislation. Currently the law on sensitive information has been introduced with no regard to current e-Health and EHR development in EU and from many aspects it blocks the e-solutions even in government projects. Regarding the Health Records, there is regulation that covers health documentation in paper form only. No legislation exists regarding the EHR. There has been a pilot EHR project (called IZIP), however the funding has been suspended and the project represents only a health-book merely. The IZIP project did not use any interoperable standard and the application data interface is not available, so no third party can take advantage of it. Moreover, no developers of hospital information systems (HIS) are forced to use any interoperable standards.

Communication

Although the meetings regarding e-Health are taking place, usually no consensus is reached as there is a lack of communication and the conversation usually gets stuck at unimportant details. The government representatives do not act as active intermediates between IT and medical experts. Also there is not sufficient participation from the standardizing organizations. The e-Health is not presented to the medical experts and public in understandable form. They see more an bureaucratic burden then any advantage. From our experience in working with medical doctors, there is usually no use of explaining highly-sophisticated technical issues. It is better to present a GUI of an application, schematic diagrams and demos.

Financial Issues

There exist many opinions against interoperability implementation. At the first place there is usually the financial aspect: IT developers, government, health-insurance companies, medical facilities and even patients are asking the crucial question regarding financing. The need of functional e-Health solution is often overlooked without understanding the negative consequences. As mentioned above, there it lacks a constructive debate and communication in the direction to patients and the society that would unify the heterogeneous groups.

2.1.4 Conclusions

With respect to future development and possibility to sense and store far more larger volumes of heterogeneous physiological parameters the issue of interoperability becomes more and more important. Interoperability may significantly influence effectiveness both of design and development of an integrated system and of its routine operation. It will become more and more important with the development of telemedicine, home care and possibility of remote monitoring of patient state. As the technology is developing very quickly we have to assume that new types of sensors and devices will appear. The newly designed and developed systems must be necessarily created as open modular systems allowing direct connection of the new sensors and devices without any need of modification of the communication and data input. Possibly new data processing module will be added. However if we only replace an old type of sensor by a new one delivering the same data (concerning semantic content) in higher quality there should not be any need for changing the software part.

Presented issues show that successful applications need coherent approach of experts from many different disciplines, i.e. information technology, electronics, communication technology, medicine. Standardization can make the way from an idea to an application much easier and faster. Thus acceleration of standardization process represents a key issue. It is important that involved companies, researchers, and standardization bodies agree and cooperate towards the ultimate goal – defined standards. There has not been space to mention the expressive power of ontologies, their flexibility, extensibility, and their potential in various applications in biomedicine. We should be aware of their potential for future applications. It is expected that new tools will be developed that allow more efficient work with ontologies, including development of virtual ontology libraries, or ontology visualizations. We

should also mention the inevitable spread of no SQL databases. These might find their use in the EHR solutions due to their inherent properties.

For the Czech Republic, there is no informative material that would present medical experts the advantage of the electronic solution and persuade them that the change can be carried out with minor invasion. The question is whether the impulse should come from government, medical experts or even patients. There is missing a communication based on the view from the position of the patient that might influence medical doctors, medical doctors would apply to medical insurance companies, medical insurance companies to the government, etc. Currently there is no solution for m-Health, so there is perfect opportunity to start from scratch with correctly defined interoperable structure using widely acknowledged standards.

Electronic signature is widely used and understood. However the medical records should also have a guaranteed timestamp that reflects the order of data-change. The permissions and authorizations for manipulation of medical data together with defined responsibility need to be defined.

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2.2 Japan: Case 1: Best practice of SaaS type medical network solution in Japan

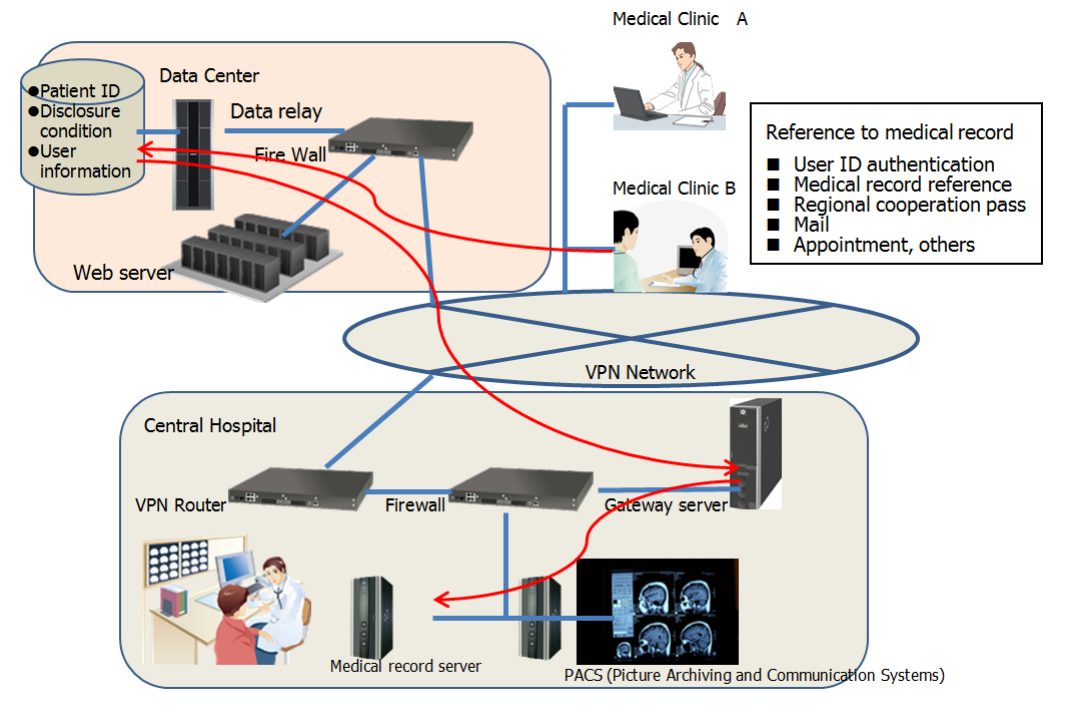
2.2.1 Background

- [2]There are increasing needs and financial concerns for healthcare services for the aging societies in Japan. ICT is one of the important tools to solve these issues. Fujitsu Limited introduced the SaaS type regional medical network solutions as a platform to share the medical information for the collaboration among healthcare related parties.
- In the developing countries, there are shortages of doctors and facilities for medical services, and the gaps between rural and urban areas. Telemedicine is one of the ICT applications expected to work effectively to improve the situation.
- We introduce the SaaS type medical network solutions in Japan for the study of its effectiveness in the different countries.

[2] Shigehiko Yasumura, Fujitsu Limied, Japan. See document SG02-C-0184

2.2.2 Overview of SaaS Type Medical Network Solution

Figure 20: SaaS type medical network solution



- As the medical record or other patient information are valuable personal information, it is necessary to keep such information secured from the threats, such as leakage and manipulation, vicious stoppage of services.
- The system (Figure 20), keeps the patient information stored at the original medical institutions where the patient information was recorded. When a doctor of other medical clinic would like to see the information remotely, he or she should access Data Center as an intermediate connection center. The Data Center will only provide gateway function without storages, and you will be released from the security risk for keeping the precious information outside of hospital.
- Off course, the Data Center is protected with strong facility management and security counter measures so that the medical institutions can use its services safely.

2.2.3 Key Benefits of Services

Applicable usage for developing countries

- In developing countries, the shortages of medical doctors and medical facilities and equipment for inspections or treatments are critical issues, especially in remote areas.
- Therefore, it is useful to realize the seamless medical cooperation among the doctors and medical institutions in rural and urban areas. Together with the telemedicine, this kind of service will help the patients to access the advanced medical service at major cities and the results can be shared with the local doctors.

Advanced features

- This system will enable relevant medical institutions to access the patient information, such as medical record, inspection report, MRI and other images, etc. according to the predetermined

condition of disclosure. Using this service as the common data base for hospitals, clinics, pharmacies, etc., we can provide the cost effective value-added advanced services to patients.

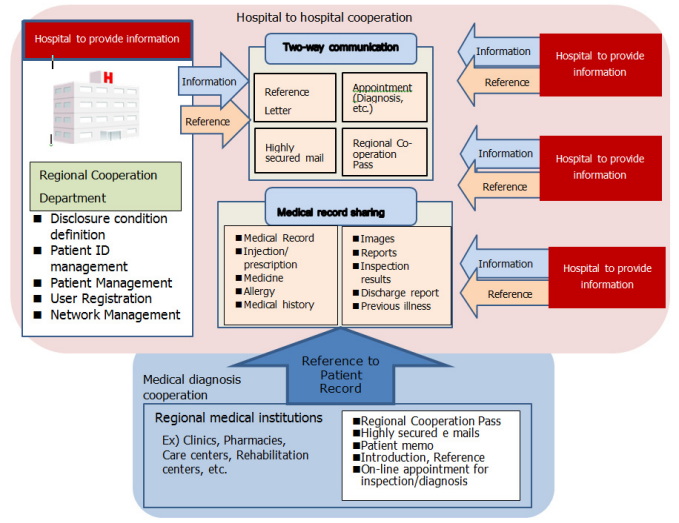
- For example, “Forwarding Cooperation” (name of service) is the introduction of patient from a clinic to Central hospital for advanced medical treatment and “Backward Cooperation” is the introduction of patients from Central hospital to clinics or Care centers so that the patient in the recovery process can use suitable rehabilitation facilities or would be introduced to home doctors for daily cares.
- For the advanced inspections such as MRI, the appointment with the special doctors of MRI can be made with the relevant information through the system. The MRI images can be reviewed at clinics remotely on the same day of such inspection.

Figure 21 shows the possible information sharing and medical support features.

2.2.4 Conclusion and further action items

With the use of SaaS type medical network solutions, we can realize medical care network connecting the servers and equipment at various medical institutions and share the information stored in the servers at each location. This will enable the effective use of advanced medical equipment and connection between rural and urban areas.

Figure 21: Key functions



- To make the best use of the service, it is important to improve the availability, convenience and cost effectiveness so that the service will be used more frequently. By adopting the industrial standards, such as SS-MIX (*1) standardized storage and DICOM (*2) and others, we can cooperate with various vendors to increase the availability and cost effectiveness.
- After the Great East Japan Earthquakes, from a view point of BCP (*3), there is an increasing need to keep the data such as medical record in the secondary safety places. We should study further the solution for disaster management such as data back-up services.

Notes:

*1) SS-MIX: Standardized Structured Medical record Information eXchange. SS-MIX promotes the electronic processing and standardization of recorded medical information related to all the medical institutions.

*2) DICOM: Digital Imaging and COmmunication in Medicine. A standard developed by ACR and NEMA to define the format for medical images, such as CT, MRI and CR, and the protocol of communication between medical imaging equipment.

ACR: American College of Radiology

NEMA: National Electrical Manufacturers Association

*3) BCP: Business Continuity Plan. It is a plan to minimize the damages on the business assets and to keep the core business continuing or the prepared plan for early recovery from the damages in case enterprises face the emergency situations, such as occurrence of natural disasters.

2.3 Japan Case 2: Development of the Electronic Doctor's Bag

2.3.1 Introduction

[3]Japan, regarded as a super-aging society, must consider how to suppress the coming inflation of nationwide medical cost in the very near future. Moreover, a declining population in rural areas is accelerating the disparity of health care services.

To tackle these problems, the Japanese government is promoting the policy to encourage home medical care. The home care support clinic system, which intends to spread clinics operating house visit services on 24-hour schedules, was established in 2006. However, in the case of a small clinic, a physician may be forced to work in a sleepless and hard working environment. And transportation times to patients' homes reduce the efficiency of medical care.

On the other hand, information and communication technology (ICT) is a possible strong means to solve these social problems. Our research group established a consortium, "The Consortium for Medical Information Communications System in the Mobile Environment", on March 4, 2009. The consortium consists of a university and seven companies, and its main purpose is to provide the ubiquitous communications system for home-visit medical service, mass examination, emergency care and disaster medical care. In collaboration with the Sendai Area Knowledge Cluster Initiative supported by the Ministry of Education, Science, Culture and Sports, the consortium has newly developed a prototype of the ubiquitous communications system named "Electronic Doctor's Bag", which can easily send biological information with high-definition image of a patient in mobile environment. The main purpose of this system is that a nurse with the Electronic Doctor's Bag visits a patient's home instead of a doctor, but an equivalent face-to-face communication can be realized between the doctor in his clinic and the patient at his home, respectively.

The first prototype, which is called "P1" here, had been developed and evaluated by a few doctors and nurses. Their opinions were used to improve the system. In January 2010, the second prototype "P2" was developed and tested. In this report, the validity of the Electronic Doctor's Bag, including both prototypes, is reported.

2.3.2 The first prototype of the Electronic Doctor's Bag (P1)

System configuration

The features of the proposed system are as follows:

- Secure telecommunication is established between a patient and a doctor using personal authentication and encryption technologies.

[3] Isao Nakajima, Department of Emergency and Critical Care Medicine, School of Medicine, Tokai University, Japan. See document RGQ14.3.2-INF-0012

- In addition to submitting biological information such as electrocardiographic (ECG) and blood pressure, pseudo face-to-face clinical examination can be achieved by sending high-definition images of a patient.
- The system is available in the mobile environment. So it is possible to examine in a patient's house without the Internet setup or in a moving vehicle such as an ambulance.
- The system can flexibly meet the diverse health care needs of various conditions and diseases in combination with portable measurement devices.
- The system can control biological data or medical records as digital data because it is based on a personal computer. Thus, it will be able to be used in conjunction with electronic medical charts and online medical bill processing systems in the future.

Here is shown the use of P1. First, personal verification of a patient is done with a non-contact type IC-card "Felica" to avoid mixing-up patients. Secondly, high resolution video picture of the patient is taken to verify his state such as complexion, skin trauma, motion of joints and gait. The video is highly compressed and coded for preserving individual security and is sent to a medical doctor staying in his clinical office via the mobile network and the Internet in a real time fashion.

The proposed system targets the diagnosis of general chronic diseases such as circulatory disease, diabetes and respiratory organ disease. Therefore, in the system, not only the patient's video image but also various kinds of biological data can be measured with portable measurement devices such as the 12-lead ECG monitor, a blood-pressure meter, a blood sugar level meter and an ultrasonic diagnostic system. Most of these devices are connected directly to a main body of the Bag via general interface such as USB. The biological data is also sent to the doctor's computer after compression and encryption as well as the video image.

Experiments using P1

Experiments using P1 were performed at two clinics and one regional center hospital with three medical doctors and two nurses to test the validity of P1 under the assumption that a nurse visits a simulated patient's home for a medical care.

As a result of the experiment, it could be verified that video images transmitted by P1 were useful for checking the patient's state from the view point of the medical doctor. And the function of almost automatic transmission of biological data: ECG and blood pressure was highly evaluated by the nurses. However, they assessed that the setting procedure of the video camera and the connectivity of the main body of the Bag with the peripheral devices and the electrical power unit should be improved to be much simpler. In particular, it was found that setting and operation of the video camera may prevent the nurse from taking care of the patient and performing other usual medical tasks.

Improvements of the Electronic Doctor's Bag

In consideration with the evaluation results of P1, the Electronic Doctor's Bag has been reviewed. The device that the nurse carries has been improved mainly in its portability (Figure 22) and the unit that the doctor uses has been simplified because of the introduction of a central streaming server.

I mprovements in the new system (P2) are as follows:

a) Personal authentication

A vein authentication tool is adopted in P2 instead of the IC-card which was adopted in P1. Such a biometric tool reduces risks of the loss of the card and mixing-up among patients.

b) Interface for transmitting the ECG data

ECG data is submitted to the main body of the Bag via Wireless LAN to enhance the operability. A mobile router for the Wireless LAN is incorporated in the Bag.

c) Video camera

A digital video camera used in P1 had high performance such as the function to avoid blurring of images due to hand movement but it was heavy and not easy to operate. In P2, a light weight and inexpensive web camera is adopted to improve the operability.

d) Ultrasonographic monitor

Some medical doctors who evaluated P1 pointed out that the portable ultrasonographic unit used in P1 did not have enough image resolution to check cardiovascular states of the patient. In response, a new portable ultrasonographic unit with high resolution is adopted in P2.

Figure 22: The second prototype (P2) of the Electronic Doctor's Bag

e) Central streaming server

In P1, the dedicated server "Digital Gate" which controlled communication between the Bag and the doctor's PC had to be located in each clinic. On the other hand, in P2, this server has been replaced with a central streaming server located in a server center. This change enables plural doctors to receive the data of the same patient simultaneously anywhere and all over the world by accessing the central server via the Internet. Furthermore, this enables the doctors to refer and share the patients' previous data.

f) Split-screen display

The video image from the ultrasonographic unit and that from the video camera are submitted to the central server and these two images can be displayed on one screen of the doctor's PC. This function enables the doctor to check the position and the posture of an ultrasonic probe operated by the nurse while watching the echographic image.

In addition to the doctors who had evaluated P1, we asked another two doctors, who were working mainly in home visit medical services, to evaluate P2. As a result, most of the doctors gave a good evaluation on the basic function of the system, but required further improvements in the portability and operability to put it into practical use. And there was a problem that the proposed system was strongly affected by the quality of mobile communication network. This means that the streaming video of the patient can be broken up at worst when the Bag is connected to a busy network. For this reason, P2 should be used in consideration of a place and hours that affect the communication speed. In the future, the Bag should incorporate a technique of switching the mobile network to connect automatically and dynamically based on communication volume. And it is necessary to develop a database for patients to use, a system for cooperation among medical doctors and a link to the database of electronic medical charts.

On the other hand, the proposed system may be applied to some healthcare services other than home-visit medical service, i.e., healthcare rooms in schools or companies, mass examination, emergency care in ambulance cars and so on. In particular, if emergency medical technicians on ambulance cars can submit high-definition video images of patients' body or their echographic images to doctors in a hospital, these data will be a very useful for procedures or treatments in the hospital.

2.4 Japan: Case 3: Mobile Support Tool for Doctors

2.4.1 Introduction

[4]EMR systems are becoming popular in medicine (A.L.Rector. 1996, Anderson JD. 1999, David W. Bates et al. 2003, Samuel J. Wang et al. 2003, Jim Johnson. 2010). This is because such systems enable doctors to manage mass medical data easily. As represented by POMR (Weed LL. 1968), medical record systems have been expected to support doctors' planning. However, most of these EMR systems are only capable of performing electronic data storage of legacy medical records. To help doctors analyze medical data that are generated over time, the system has to have the ability to present medical data that occur over various time spans. Because medical data often occur over various time spans, doctors have to study it over various time spans when performing a medical analysis. With current systems, doctors can look at medical data for only a few days at most. Accordingly, they cannot analyze medical data effectively. In addition, there is another problem that doctors do not have much time to use the EMR at their desks. As a result of these problems, doctors require a system that can support their cognition and medical analysis regardless of where they are. In view of these problems, we developed a brand new EMR system that supports doctors' understanding and medical analysis. This system has the features listed below:

- It has the ability to present medical data that occurs chronologically over various time spans.
- Its client application works on mobile devices such as a mobile phone or a tablet PC.
- In spite of the narrow bandwidth of wireless mobile networks, the system responds quickly.

In this paper, we introduce the conventional EMR systems in section 2 and explain their problems. In section 3, to solve these problems, we introduce the Mobile Timeline EMR System and its technological features.

2.4.2 Conventional EMR Systems

In this section, we introduce the conventional EMR systems. Typically, a conventional EMR system has a user interface similar to legacy medical records written on paper. Also, it displays the patients' SOAP information and the patient's information for one day. With these systems, by treating medical data as electronic data, doctors can search and manage their patients' medical data easily. This ability of mass data management is a significant advantage compared with legacy medical records. However, there are various kinds of medical data that are generated over various time spans. Thus, with these systems, which can make medical data available for only a few days, doctors cannot always look at it and infer the relationships that may exist among the various data. In other words, though doctors can look at and understand the state of patients who come for consultations two or three times with these systems, doctors are unable to examine and understand the state of patients who may have been suffering from certain conditions for years, such as asthmatics, diabetics or patients suffering from hypertension. Accordingly, these systems are unable to attain the purpose of supporting doctors' analysis and understanding.

2.4.3 Mobile Timeline EMR System

As described above, in order to meet the need to support doctors' understanding and medical analysis, the system must have a function to present medical data that are generated over various time spans and allow doctors to look at medical data from any perspective. In order to solve this problem, we have introduced a timeline interface. The timeline interface has a multistage time scale including years, months and days. With a timeline interface, the system can present chronological data over various time spans.

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[4] Keisuke Ogawa, KDDI R&D Laboratories Inc., Tokai University, Graduate School of Medicine, Japan. See document RGQ14.3.2-INF-0013

In addition, in order to meet the demands for mobility and portability, we use a mobile device as a client of this system. By adopting a mobile device, the system gains a significant advantage in that doctors can analyze data anywhere. However, mobile devices have the problems listed below:

- Difficulty with input and reading using a small display.
- Low data transmission rate through a mobile wireless network.

To solve problem (1), we adopted an advanced word completion function using an optimized lexicon for each field of medicine.

For problem (2), we implemented the Adaptive Event Merge algorithm that reduces data transmission.

By means of the above, we can create a tool that is capable of supporting doctors' understanding and analysis wherever they are.

2.4.4 Timeline Interface

The timeline interface is the most important part of this system. With timeline interface, doctors can change the time scale to various time units. For example, doctors can change the unit time scale from hour to day or to month. By changing to a smaller time unit, doctors can observe medical data over a short time span in detail. Conversely, by changing to a longer time unit, doctors can look at medical data over a long time span. The length of the time unit can also be changed by pinch-in/pinch-out. The reasons why we use this interface are presented below:

There are various kinds of medical data. They occur over various time spans and they are interrelated in various ways.

If the different data are interrelated, the appropriate time scale for observation can be chosen. By selecting the appropriate time scale, the system can elucidate the relationships among the data.

For example, take the case where relationships can be discerned when data are observed over a long time span, where this would not be case if observation were to occur over a short time span. Conversely, there are other cases where relationships are not apparent when data are observed over an excessively long time span. Accordingly, the system must have a function that allows users to select the appropriate time scale.

With this timeline interface, doctors can change the time scale at will. Therefore, the various relationships between various data can be observed. In other words, doctors can examine medical data from various points of view.

In this manner, this system can serve not only as a tool for managing medical data, but can also support understanding and medical analysis.

Word completion using lexicon for medical data

The input method is not only an important factor that decides the usability of the system on mobile devices, but also a difficult problem. This is because mobile devices only have poor input accessories such as small touch panels and keyboards. In particular, in EMR systems, doctors have to input special characters for medical treatment using these poor input devices to write down the SOAP information or to search patients. To solve this problem, the word completion method using a lexicon of medical words is well known and effective (Laird S. Cermak et al 1992, C. G. Chute et al 1999, Hiroyuki Komatsu et al 2001). However, the words used in medicine differ significantly among the different fields. In other words, using the same lexicon for all the different areas of medicine would be limiting and inadequate. For example, the phrase 'nephrotic syndrome' is often used by paediatricians, but is rarely used by ophthalmologists. Accordingly, we have optimized the lexicon for each field of medicine. Simply put, we changed the bias of the TRIE (Donald R. Morrison 1968) structure of the lexicon for each field. Then for each field, by summarizing and analyzing the most common inputs from doctors in a particular field, the system succeeded in improving the accuracy of word completion.

Adaptive event merge algorithm

The response speed of the system is a very important factor for deciding the system's usability. The advantage of the timeline interface is, as we described above, the ability to visualize the relationships among medical data by varying the time scales. If doctors want to look at data over a long period, they can expand the time scale as they wish. However, the system has to display a lot of data objects at once. On the other hand, in this system, since its client is a mobile device, the client only has narrow wireless communication bandwidth. In order to improve the response speed in this system, we implemented an Adaptive Event Merge algorithm. This algorithm is a function that merges neighbouring data objects adaptively.

When doctors expand the time scale, if the time gap of the neighbouring data objects is smaller than the threshold, the system merges the objects into one object. In this manner, the system can reduce the amount of data transmitted and improve the response speed and usability.

2.4.5 Conclusion

In this paper, we introduced an EMR system based on a new concept. This system has a significant advantage in that it is able to support doctors' understanding and medical analysis wherever they are. The system has the three features described below. With the timeline interface, doctors can look at and analyze medical data using various time scales. This is a significant help for doctors' understanding and analysis. Since its client is a mobile device, the system can support doctors wherever they are. In spite of using a mobile device as a client, the system can respond very quickly. In addition to the features described above, as the system is easy to use, there is a possibility that the doctors can use it as an educational tool.

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2.5 Japan: Case 4 – The Network of Perinatal Telemedicine

2.5.1 Introduction

[5]Our company has developed and sells mainly electronic medical records for perinatal care and other health care systems since 2002. Company name of MITLA is derived from the Medical information technology laboratory. The history of research in the field of medical information is new in Japan. The history of the medical technology system in Kagawa prefecture has developed according to the Japanese governments agenda. I can tell that we have traced the history in the world of medical IT. We will focus on following four main topics, as a case of the perinatal telemedicine between Tono city and the centre hospital.

Here perinatal refers to the period before and after childbirth. According to ICD-10, the perinatal period which is defined as less than seven days after birth from 22 weeks gestation.

2.5.2 Background and Issues

The medical IT system being triggered by Kagawa prefecture is the project of the perinatal electronic medical records network in 1998. Recently Kagawa prefecture is known to K-mix that is the remote diagnostic imaging system. Various medical IT systems were created around the electronic medical records. MITLA has developed a perinatal electronic medical record named Hello Baby Program. The other hand, the number of obstetricians and gynecologists has decreased from 1984 to 2006. This has caused many problems to some regions of Japan. The most common is the Tono city. There are no obstetricians in Tono city, Iwate Prefecture. Pregnant women need a prenatal check-up once a month or more. For this to occur there was a medical centre built called Net Yurikago in 2007 (4 year ago). Here pregnant women can have regular checkups from midwives. If the patients have any worries or concerns she can talk to a doctor via the internet.

2.5.3 Telemedicine System Configuration

There are 2 servers used at the data centre. There is a pc and cell phone at the hospital and mid wives centre. At the maternity centre there also is a mobile CTG also used. MILTA monitors the system daily so that no problems occur. You can see here a picture of the mobile CTG Monitor (Figure 23 **a**). As you can see it's small and very light. I like you'd be surprised how easy it is to use. The data taken using the CGT which was sent to the doctor's cell phone and computer. The above graph shows the baby's heart rate and the graph below shows the mother's contractions in the display. For the while the doctor can access the patient's monitored data through the Hello Baby program (Figure 23 **b**). The midwife in the maternity centre meet pregnant woman and input checkup data to the Hello Baby program. Doctors can monitor the patient's data during the whole perinatal period (10 months).

[5] Yhuko Ogata, MITLA Co., Japan. See document RGQ14.3.2-INF-0014

Figure 23: a) Mobile CTG monitor and b) Typical display of Hello Baby program

a) b)

How to Operate the Telemedicine System

The patient uses the CTG system at home, which gathers the baby's heart rate and mothers contractions then this data is sent to the midwives, which is then sent to the hospital where the doctors can see the gathered data. This is very convenient because the midwife and doctor can both share the data. The doctor can see all the data at a touch of a button. This also caught the eye of doctors in America and there was an article written in the New York Times.

Figure 24: The network of perinatal telemedicine

Application and Development

Babies who use this system will have their lives monitored to the end of life. In addition, Tono city staff members believe it is important to measure and confirm health data for all its citizens. This is an example of a child's case. The mother inputs the child's data once a week until the child graduates high. This slide shows the establishment of the telemedicine information network system. Before the patients had to travel far from rural towns to see a doctor but now they can now use telemedicine to communicate with from home.

Acknowledgement

We would express our thanks to Professor Hara Kazuhiro from Kagawa University, Ogasawara Toshihiro, Hospital Director of Ohfunato Prefectural Hospital in Iwate Prefecture and Tono city staff.

2.6 Japan: Case 5 – The Novel Mobile Telemedicine System for Real-time Transmission of 12-lead ECG Data and Live Video from Moving Ambulance to Hospital

2.6.1 Introduction

[6]In Japan, a telemedicine system utilizing a car phone was first made available in ambulances in the 1990s. The original analog car phone was later replaced with a digital mobile phone, enabling the transmission of 1- or 3-lead electrocardiogram (ECG) and heart rate (HR) data from the ambulance to the hospital. Consequently, a large number of ambulances in Japan were equipped with this telemedicine system.

However, despite the ready availability of the system, a large number of the devices were not used widely or effectively. One of the reasons for this was the presence of motion artifacts and other noise in the ECG data.

This mobile telemedicine system did, however, seem particularly applicable to emergency and disaster situations, where medical doctors wanted to use ambulances and temporary shelters as consultation rooms for the urgent diagnosis of heart disease. In the event of a disaster especially, it is necessary to diagnose victims in such settings over a period of several months since many victims fall ill due to stress.

Even though a large quantity of data was transmissible by the information communication technology (ICT) system developed, it was difficult for doctors in the hospital setting, separated from the patients, to reduce the frequency of misdiagnosis. In emergency and disaster medicine, misunderstanding the medical data provided can often make the situation graver.

The question then arose: Why could medical doctors not reduce the frequency of misdiagnosis? This was entirely due to the fact that the doctor and patient were in entirely different settings. The doctor expects to use stable data obtained in a static consultation room for diagnosis, but receives unstable data with motion artifacts and other noise under dynamic conditions in the ambulance or temporary shelter. Thus, it became necessary to find an effective solution that integrates the two different settings of the static hospital and the dynamic ambulance.

To this end, we realized the multi-functional electrocardiograph “Radarcirc”, which transmits the patient’s live image and vital signs, such as 12-lead ECG, the analyzed ECG data, blood pressure and oxygen saturation (SpO2) data, to the hospital in real-time [1]. The name “Radarcirc” is derived from the fact that the device can detect circulatory disease exactly as radar detects an airplane. The system enables the medical doctors in the hospital to remotely control the camera in the ambulance. The most important function of Radarcirc is that is makes the measurement and analysis of 12-lead ECG possible even in the case of severe motion artifacts and during cardiopulmonary resuscitation (CPR) [2].

In this study, the anti-artifact ability of Radarcirc was examined and the significance of Radarcirc for integrating the different medical settings is discussed.

2.6.2 Materials and Methods

12-Lead ECG, SpO2 and blood pressure were measured by the Radarcirc (Dainippon Sumitomo Pharma Co., Ltd.) and these data were transmitted by a mobile telemedicine system (Dainippon Sumitomo Pharma Co., Ltd. and NTT Comware Corp.) using a FOMA telephone (NTT DoCoMo, Inc.) (Figure 25).

The function of Radarcirc is based on adaptable filtering and weighted-mean technologies (Figure 26).

The artefact-resistant function of Radarcirc was examined using data simulation. The simulated sine waves were added to the lead-II waveform from the ECG checker (Nihon Kohden Corp.). The sine wave frequency was changed from 0 to 0.3 Hz and the sine wave voltage from 0 to 3.2 mV. Figure 27 shows an example ECG with 0.3 Hz noise and a 3.2 mv sine wave.

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[6] Masayuki Hashimoto, KDDI R&D Laboratories Inc., Japan. See document RGQ14.3.2-INF-0016

Moreover, a comparison was made of the automatic recognition by Radarcirc and manual recognition by 5 medical doctors of the points Pa, Pb, Pe, Qb, Stj, Ta, and Te for 30 beats in the following 20 files stored in the ECG database, QTDB: sel 100, 103, 4046, 16265, 16272, 16273, 16420, 16483, 16539, 16773, 16786, 16795, 17453, 230, 231, 32, 41, 803, 808 and 811. The representative values for the automated and manual recognition were calculated for each file by averaging the data for the 30 beats. The absolute values of the difference between the automated recognized point and the manually recognized point were analyzed statistically. Significant differences were evaluated using Dunnett's multiple-comparison test, with significance set at $P<0.01$ or $P<0.05$.

2.6.3 Results

The adaptive filtering and weighted-mean technology realized robust low-cut filtering without waveform distortion (Figs. 2 and 3). When the frequency change from 0 to 0.3 Hz and the voltage change from 0 to 1.5mV were added, the waveform distortion was less than 1% in every case (data not shown).

In the comparison of automated recognition with manual recognition by the 5 medical doctors, there were no significant differences between the two representative values for automation and manual recognition (Table 1).

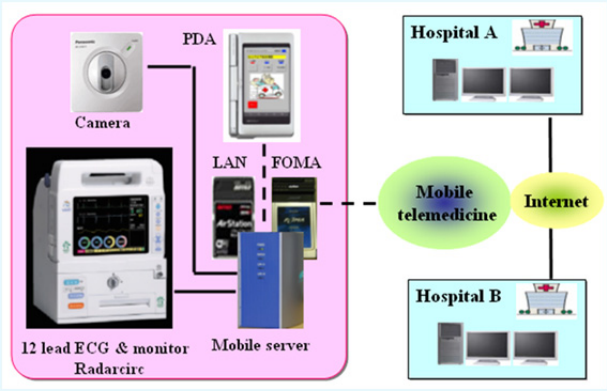
2.6.4 Discussion

The electrocardiograph and the electrocardiograph monitor are different devices. The electrocardiograph with its weak filters and low resistance to noise is used for the exact diagnosis of heart disease because there is no distortion of the ECG. The electrocardiograph monitor with its strong filters and high resistance to noise produces a distorted ECG and thus is used only for the monitoring of the patient's condition. Radarcirc technology realizes both functions – the electrocardiograph and the electrocardiograph monitor–simultaneously, enabling Radarcirc to analyze ECG during CPR [2]. This function is based on the adaptive filtering and weighted-mean technology.

The Radarcirc technology incorporated in the new device we examined here was born from FLUCLET technology [3]-[4], which was developed as an analysis system of heart rate and blood pressure fluctuations in animal and clinical experiments [3]-[6] through independent pharmacological research at Dainippon Sumitomo Pharma Co., Ltd. Thus, Radarcirc makes it possible to monitor and analyze every beat of the patient's heart even in the event of sudden external shocks and vibrations or in the presence of motion artifacts.

As mentioned above, communication between multiple persons in different circumstances in different settings can often result in misunderstandings, especially in emergencies involving doctors in the hospital (static setting) and emergency medical technicians in the ambulance or temporary shelter (dynamic setting). We aimed to solve the problems resulting from this separation by considering two important points. First, it is necessary for the medical doctor in the hospital to ascertain the patient's status in the dynamic setting freely. Second, it is necessary to convert the dynamic 1- or 3-lead ECG data with motion artifacts or other noise into static and detailed 12-lead ECG data without noise and distortion so it can be effectively used by the doctor.

Figure 25: Real-time mobile telemedicine system

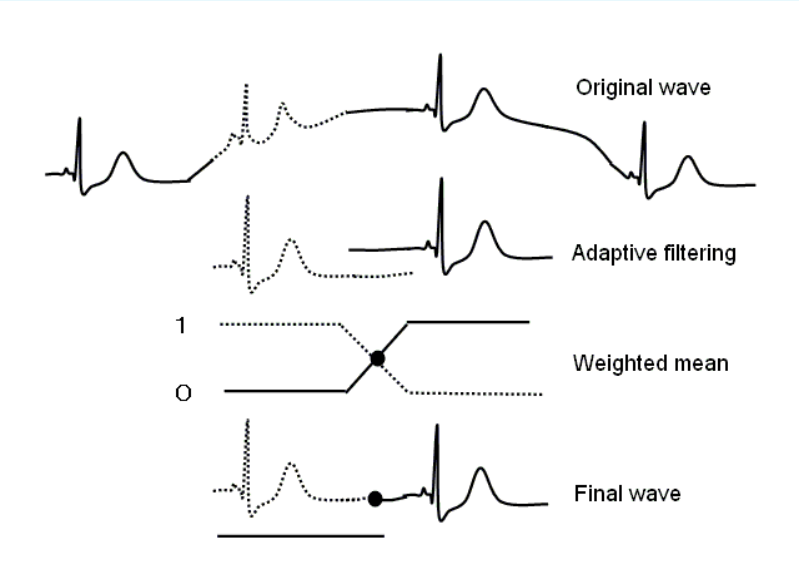


The breakthrough allowing us to address both these issues came in the form of progressing information technologies (IT) to advanced ICT. Advanced ICT meets the demands of practitioners to support communication and integrate information between different settings with practical meaning. In Japan, awareness of these issues was sparked by Kitaro Nishida in philosophical fields and are discussed and applied by Hiroshi Shimizu in scientific fields [7]. The integration of the different circumstances and settings is expressed in Japanese as the integration of “Ba”, a technical term that is now in frequent use worldwide.

The use of high-speed data communication alone is not sufficient to realize the integration of different “Ba” (i.e., the different circumstances and settings). Advanced ICT, however, seeks to employ an intelligence to integrate them. The integration of the different “Ba” by the combined technology of Radarcirc and the mobile telemedicine system provides a good example for the development of other advanced ICT systems in the future.

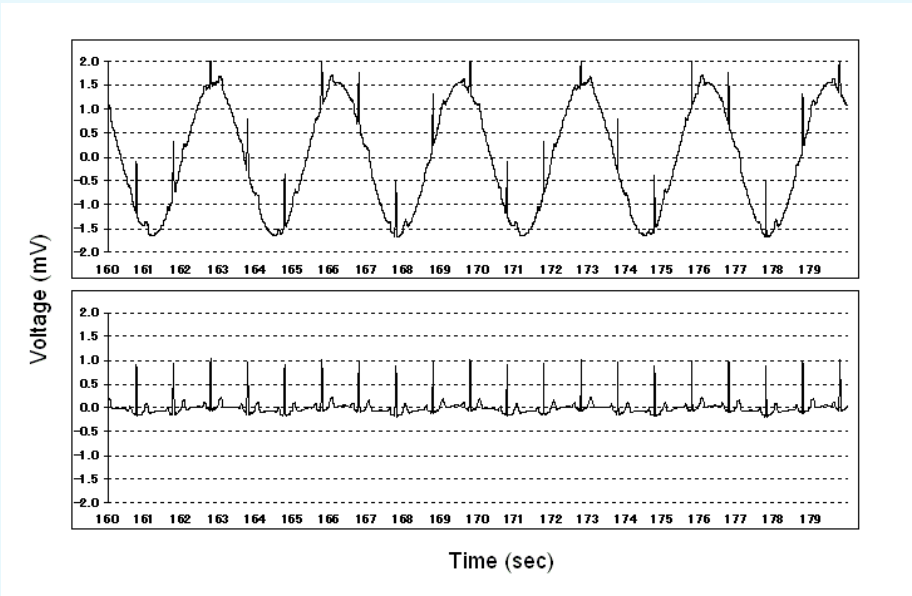
12-Lead ECG, SPO2, and blood pressure data are transmitted in real time by a FOMA mobile phone to the hospital servers via the internet.

Figure 26: Adaptive filter and weighted mean



An adaptive filter is used for each heartbeat. Each filtered ECG signal is connected smoothly at the point by the weighted mean method. For the final ECG signal, the ECG wave with a broken line is distorted compared to the other ECG waves.

Figure 27: Effects of adaptive filter and weighted mean for artificial noise



Upper panel shows ECG with artificial sine noise. The amplitude and frequency of the noise is 1.5 mV and 0.3 Hz, respectively. Bottom panel shows ECG after filtering by Radarcirc.

Table 1: Difference between automated and manual recognition for points in ECG database files

Recognized point of ECG	Pb	Pa	Pe	Qb	Stj	Ta	TE
Mean	2.2	1.8	4.7	2.5	0.2	1.3	0.9
S.E.	1.5	0.9	1.7	1.1	1.0	1.2	2.1
Statistical difference	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

At each recognized point, the absolute values of the difference between the automated recognized point and the manually recognized point were analyzed statistically (n=20).

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2.7 Japan: Case 6 – Telemetry for Wild Birds and Future Technical Expectations to Prevent Avian Influenza

2.7.1 History

[7]The ITU-D Study Group 2 Question 14 Rapporteur's Meeting for Telemedicine, hosted by the Ministry of Internal Affairs and Communications of Japan, was held at the Kokusai Bunka Kaikan in Tokyo on July 3–4, 2008. This meeting featured active discussions on the Statement of Appeal on an Integrated Information and Communications Network for Avian Influenza (commonly known as the Statement of Appeal on Avian Influenza), which was finally adopted after incorporating a wide range of suggestions and after repeated revisions and input, at the ITU-D Study Group 2 meeting in September of 2008.

The following actions relate to the application of telecommunication technologies to prevent and contain avian influenza, and for adoption and implementation of these actions under the Statement of Appeal on Avian Influenza.

[7] Masayuki Hashimoto, KDDI R&D Laboratories Inc., Japan. See document RGQ14.3.2-INF-0015

Summary of the Statement of Appeal on Avian Influenza (ITU-D Study Group 2 Question 14 Rapporteur's Meeting, Tokyo, July 2008).

2.7.2 Principle of Information Disclosure

Any governments and individuals involved must disclose information on avian influenza infection immediately upon its discovery.

2.7.3 Tracking Technologies

We ask ITU and associated governments and corporations to seek to develop technologies to track bird migrations, including nano telemetric devices, short- and long-distance RFID, data collection satellite systems, and so forth.

- Securing Radio Frequencies

The following tasks will be assigned during the implementation of tracking technologies:

- ITU-R: Priority utilization of frequency bands.
- ITU-T: Standardization of technologies.
- ITU-D: Provision of know-how free of charge to developing countries.

2.7.4 Integrated Information Network

ITU will work with WHO to create the Information and Communications Network for Avian Influenza, disseminating, to various nations, telecommunication technologies to prevent and contain outbreaks.

2.7.5 International Organizations

The relevant international organizations should work together with ITU to integrate various advanced ICT networks to prevent avian influenza outbreaks and to call on individual governments for participation in the network.

2.7.6 Establishment of Human Resource Training Programs

International organizations and governmental aid agencies are encouraged to provide educational materials, knowledge, and invitational programs to train specialists in related fields (telemedicine, especially for avian influenza tracking, information networks, etc.) in developing countries.

2.7.7 About Avian Influenza

Outbreaks of avian influenza caused by widespread transmission between birds, animals, and humans are believed to have inflicted a grave human toll from time to time, starting in ancient times.

The genes of the avian influenza virus are known to mutate rapidly, creating an obstacle to preventive strategies by hindering prompt identification of the respective antibodies for the antigen and vaccine preparation. Some researchers predict avian influenza may result in death rates of 50% in developing countries and 10% even in developed countries – alarmingly high compared to SARS, which recorded a death rate of 4%. The influenza viruses that cause epidemics today were once highly fatal to humans; however, their pathogenicity has decreased over time. Generally, mutations occurring in viruses found in carrier birds (geese, duck, sea swallows, etc.) during bird-to-bird transmission increase pathogenicity, producing new strains of avian influenza. The body temperature of the birds involved is considered to be one of the parameters affecting the process. The consensus view among experts is that it is simply a matter of time until bird-to-human transmission occurs from migratory birds carrying high-pathogenicity viruses. In nature, deaths among wild birds go unnoticed by human observation, and a major cause of such deaths may be the influenza virus.

Despite the importance of epidemiological monitoring in these biomes, no system has been established for real-time monitoring of avian influenza on a global scale. Such efforts would most likely fall under the

jurisdiction of WHO, but since they would require the development of new technologies and since the regulation of frequencies and standardization of technologies is primarily the duty of the ITU, cooperation between the two organizations is crucial.

2.7.8 Present Satellite Technology

ARGOS system (DCS)

Theme: The maximum weight of instruments that can be carried by wild birds is 4% of their body weight. This places significant constraints on antenna size and transmitter power source. The basic technologies used in the first-generation ARGOS system date from the 1960s and were designed for data collection from ocean buoys. Despite efforts to improve transmission rates to broadband levels for 3rd-generation transponders, the G/T (gain/temperature, -18dB/K) of receiving antennas remains inadequate. The ARGOS terminal's lifetime will be only a few months due to battery consumption. Therefore, the ARGOS terminal on the back carry harness shall be glued on the feathers. The heavy weight of the payload can cause birds to crash.

2.7.9 Expected Technology

- Long distance RFID (built-in battery type)

The operational life of a built-in battery type RFID is directly proportional to the size of the battery (including solar cells). The device will be larger and heavier than a battery less counterpart. Long-distance RFID systems on 2.4GHz find their ideal application with medium to large migratory birds that do not collect near specific feeding areas. The only method currently available for collecting ID data is to deploy an observer equipped with a ground unit. In theory, it should be possible to perform unmanned observations by installing a unit that scans the sky, like a radar unit, at lighthouses and breakwaters along migratory routes. However, such systems remain in the planning stages, and numerous technical issues remain to be resolved.

These systems operate on frequencies within the ISM (industrial, scientific, and medical) bands. One possible choice given the propagation distance required (300–500 m) is the microwave range. The high efficiency required for the power source could be achieved via an electric double-layer capacitor (EDLC), which physically adsorbs ions within the battery electrolyte to the surface of the activated carbon electrodes in the charge cycle, then desorbs them in the discharge cycle. Unlike other capacitors, the EDLC electrical accumulation device is not based on chemical reactions. Given the extreme light weight of EDLCs, combined use with micro solar cell units may lead to long-distance RFIDs with semi-permanent operating lives. In any event, actual implementation of long-distance RFID must await further progress in R&D in the related technologies.

- LEO with advanced DCS

We would like to propose the next generation digital transponder that is an advanced DCS with multibeam on S-band to perform the on-board processing (DCS and navigation system with Doppler shift). In the case of 38dBi antenna of the spacecraft, the ground terminal with 10dBm RF-output and –10dBi antenna can transmit up to 400 bps with BPSK. This terminal attached to the leg of a bird will be suitable for a dove or a gull in size. Comparison of the ARGOS system and proposed system, 2000 times of processing speeds are necessary at the baseband level of space craft.

However, advances in the processing speed of FPGA (Field Programmable Gate Array) that can be mounted should make the required processing possible. The near-future theme for study is the development of a mounted device that can calculate the Doppler shift by the least-squares method by base-band processing per beam area. Should unused payload space remain in low-orbiting satellites scheduled for launch, we encourage space development agencies to consider including advanced DCS (next-generation digital transponders).

- Geographical Information System (GIS)

It should be possible to visually grasp the approach of suspected carriers by compiling a species-by-species distribution map of migratory birds. For example, in the month of March, few migratory birds fly along the parallel from the Korean peninsula across the Sea of Japan, but two groups of yellowlegs that consistently migrate from Vietnam to Siberia have been confirmed: 1) a group passing through the Korean peninsula; 2) a group passing through the Japanese archipelago. If the DNA types of the virus collected from the dead bodies of affected wild birds (Whooper swan) in Korea and Japan are found to be identical, the avifauna would suggest the possibility that yellowlegs are carriers. Based on independent component analysis, *n* number of data sources can be estimated from *n* number of independent observation sites based on higher-order statistics. Comprised of the geographical distribution of migratory birds, virus identification and virus geographical distribution, and the geographical distribution of patients, the GIS should serve as an effective support system for epidemiological risk forecasting. We should be able to achieve the highest cost-benefit performance in preventive effects for the available medical budget by concentrating efforts on distributing antiseptics, vaccines, and medication to regions where suspect migratory birds are known to have arrived.

2.8 Japan: Case 7 – ViewSend Internet Communication Technology

2.8.1 Introduction

[8]ViewSend Co., Ltd. was founded in October 2000 as a software development and systems integration company. ViewSend's objective was to develop videoconferencing software that would exceed the highest industry standards and to integrate that software into a more affordable, user-friendly, PC-based multimedia videoconferencing system. In June of 2004, ViewSend purchased all assets of KLT Telecom, Inc. a well-known American company committed itself to telemedicine, tele-radiology, and videoconferencing challenges. ViewSend Server/RAD, ViewSend Online and ViewSend ReportSystem, the main products of ViewSend, were widely applied to the medicine area. The customers of ViewSend were in the United States, Japan, China and Indonesia.

ViewSend RAD provides a real-time 3-in-1 telemed solution for telemedicine, tele-radiology, and videoconferencing. This product is designed to be a real-time software solution – collaboration, consultation, or training.

ViewSend Online is a web-based videoconferencing system developed by ViewSend in 2007. It is an Internet service and provides telemedicine, tele-radiology, videoconferencing and document sharing.

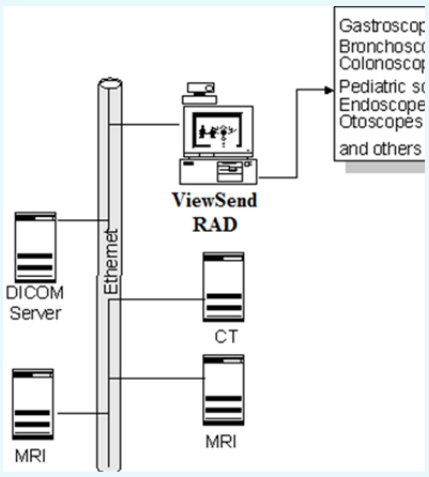
ViewSend Report System, a sub-system of ViewSend RAD, is non-real time software for tele-radiology. The report management and report format customization is available and enhanced in this software.

VIEWSEND Internet Communication Technology

- ViewSend RAD

[8] Kenei Shie, Guoliang Wang, Yang Yang, ViewSend ICT Co., Ltd., Tokyo Japan. See document RGQ14.3.2-INF-0017

Figure 28: ViewSend RAD



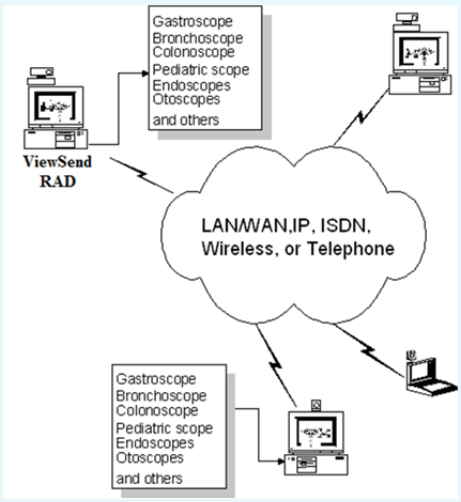
ViewSend RAD understands that the radiology workflow must be optimized for reading studies. There is no time to waste on DICOM querying, retrieving, historical information gathering. ViewSend RAD automatically pre-retrieves, organizes, and presents the data you will most often need.

Tele-radiology

ViewSend RAD is designed to be a fast, cost-effective way to retrieve your medical images/data and transmit them to remote locations. Whether the source image originates from a DICOM 3.0 modality, DICOM server, film, or medical device ViewSend RAD can prepare the series within a study and then transmit to the remote destination (Figure 28):

Telemedicine

Figure 29: ViewSend telemedicine



ViewSend RAD helps doctors increase the delivery quality of their care. Medical scoping devices can be connected to ViewSend systems through industry standard S-video or composite inputs. Digital images or video clips can be captured and transmitted in real-time to the specialist. Live video feeds can be used to enhance remote training, teaching, or telesurgery **(**Figure 29).

- Videoconferencing

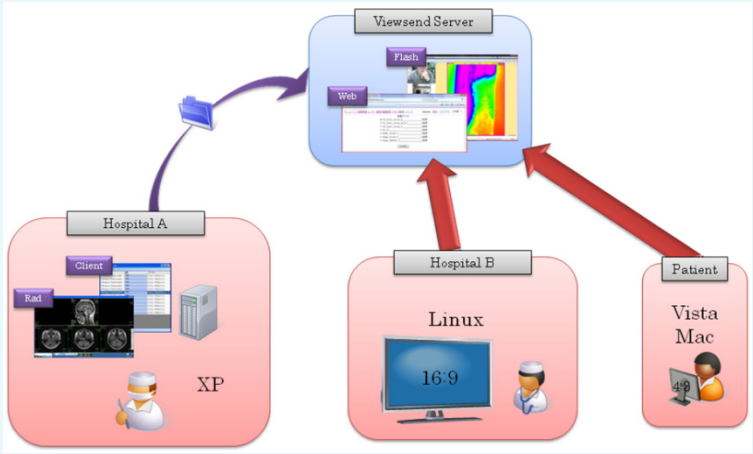
Figure 30: ViewSend videoconferencing

Rounding out the unique 3-in-1 solution, ViewSend leads the industry by providing business quality videoconferencing. Whether over ISDN (H.320) or IP (H.323), ViewSend provides a full featured video capable software solution for point to point or multipoint conferencing. Consults, second opinions, live video feeds, CME, training, teaching or telesurgery are all enhanced by integrated videoconferencing (Figure 30).

- ViewSend Online

Dicom image data are uploaded to ViewSend Online Server by ViewSend RAD to share with all users in the same group. The users login to the ViewSend Online Server by username and password to access these images. By the web service, the users can access the server by all terminal devices which support the web browser. This makes home healthcare possible (Figure 31).

Figure 31: ViewSend Oneline



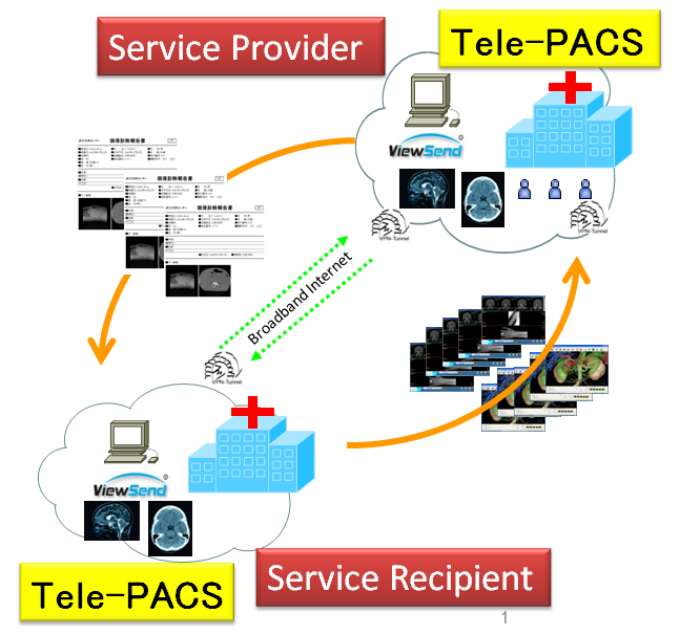
- ViewSend Report System

ViewSend Report System is a sub-system to enhance tele-radiology by the customization of report management and report format (Figure 32).

The requirement of report management differs between hospitals. The management project, work list and report format of ViewSend Report System can be modified by the XML files for the users. The medical

image data and medical records can be transmitted to the Service Provider, and the report with key image can be reply to the Service Recipient as shown in Figure 32.

Figure 32: ViewSend Report System



- Application examples

Tone Numata telemedicine network (TN-2).

There is a good example of viewsend internet communication technology at Tone Numata. In the case of emergency, video conference consultation is used and it is habitually used for medical image sharing.

2.9 Japan: Case 8 – Remote and Mobile Healthcare ICT Trials in Japan

2.9.1 Introduction

[9]In most countries, the number of elderly people is increasing recent years. Especially, Japan has faced super-ageing society. An aging society needs much higher medical cost, and it has been increasing year by year. At the same time, the number of patients suffering from life style-related diseases such as diabetes is also increasing, which is another factor to increase medical expenditure.

It is very important and is a common global challenge to support elderly people's healthcare from the view point of the Quality of Life. To solve those issues, Japanese government announced a policy to use ICT effectively, and has been putting the model projects into practice and collecting evidences in order to promote remote health care services.

In this contribution, three trial services related to remote and mobile healthcare by using ICT are introduced as examples examined in Japanese model projects. Then, this contribution proposes potential

[9] Ms Mayumi Yamauchi, Ministry of Internal Affairs and Communications, Japan and Mr Hideo Imanaka, NTT, Japan. See document 2/207

standardization items regarding remote and mobile healthcare ICT by taking account lessons from Japanese healthcare ICT trials led by Ministry of Internal Affairs and Communications (MIC), Japan.

2.9.2 Country Overview

According to recent research results, the number of senior citizens in Japan, aged over 65 years old, is 23.1%, and 20% of households are elderly people living alone in 2011. An aging society needs much higher medical cost, and in practice, the total health expenditure reached 460 billion US dollars in 2010, which has been increasing year by year. Accordingly, Japan becomes the first nation in the world facing with difficult challenges caused by super-aging society.

Such a situation happens not only in Japan, but also in other countries. In some researches, the elderly ratio of Asian countries such as South Korea and Singapore follows Japan 10 years behind. In other Asian countries, speed of super ageing is more rapid than Japan. For example, the elderly ratio will reach 20% in China and India soon. This brings tremendous number of aged people, around 5 billion, which is 4 times larger than the current total population in Japan.

2.9.3 Objectives and Strategies

Objectives: to reduce medical cost and to improve Quality of Life

Strategies: to exploit remote and mobile healthcare by using ICT

1 Activities Implemented

Three cases of remote healthcare ICT and mobile healthcare ICT are introduced as the trials in Japan.

a) Remote healthcare for monitoring after discharging, an MIC model project.

- Purpose: to provide healthcare service for Homecare Patients after discharging from hospital.
- Service: A Homecare patient is monitored its vital data such as blood pressure, heart late and pulse by a doctor who is in the hospital. Doctors and nurses visit patient on a regular basis, for example once or twice a week, to provide adequate medical treatment based on the knowledge as to how the patients have been between their visits.

b) Remote healthcare promotion for elderly, an MIC model project.

- Purpose: to promote healthcare for elderly people especially in rural area.
- Service: It shares vital data of elderly people with doctors and public health nurses, and provide remote consultation over video phone. Doctors in the city and public health nurses and elderly people in the local area share healthcare related data. Elderly people visits a community center regularly to have their physical condition checked by public health nurses and to consult with doctors in the hospital. Public health nurses will assist elderly people to use devices and internet.

c) Mobile healthcare for Post Disaster, in Fukushima after the great East-Japan earthquake.

- Purpose: to provide medical services in shelters after disaster.
- Service: After the disaster, evacuees who lost their houses and stayed in shelters for long time needed medical services, and many medical professionals came to the disaster struck area to response to evacuee's need. In order to allow for common use of medical records by these medical professionals, medical record sharing system was offered to Fukushima Prefectural University Hospital Medical team.

2 Technologies and Solutions Deployed

a) Remote healthcare for monitoring after discharging, an MIC model project.

- Remote data monitoring service using vital sensors:

- Remote consultations with doctors over video phone.
- HPKI for user authentication.
- Continua Health Alliance based video phone and vital sensors.

b) Remote healthcare promotion for elderly, an MIC model project:

- HPKI for user authentication.
- Continua Health Alliance based video phone and vital sensors.

c) Mobile healthcare for Post Disaster, in Fukushima after the great East-Japan earthquake:

- On Demand VPN service for secure network over the Internet.
- HL7 based healthcare data.

3 Changes and Outcomes Achieved

a) Remote healthcare for monitoring after discharging, an MIC model project:

- It reduces patients' physical burden to visit hospital regularly.
- It is possible to receive patient's data and to diagnose immediately, that would enable doctors to detect diseases earlier.
- Patient and their family feel safe since they can consult with medical professionals whenever they want.

b) Remote healthcare promotion for elderly, an MIC model project:

- The number of people who has disease from 6 to 1. That means 83% of improvement was achieved by this service.
- Some local governments continue to use this service after the model project has finished.

c) Mobile healthcare for Post Disaster, in Fukushima after the great East-Japan earthquake:

- What they need most was checking the patient's past medical records on site.
- Patients' medical record should be protected as much as possible even at the emergency.

4 Challenges and Success Factors

Challenges: Changing the way of doctors work.

Success Factors: Collaboration with medical doctors and their understanding to use of ICT.

5 Lessons Learned and Next Steps

Remote Healthcare and Remote Health promotion are relatively easy to start-up in technical sense. People are able to send their vital data and receive advice from doctors at any time and any place. They are also able to be consulted by doctors when they need. Doctors can check patients' condition with their own eyes through TV phone. If all devices are based on global standards, healthcare ICT will be easy to start-up and will be cost effective. Remote healthcare ICT and mobile healthcare ICT are really effective to provide better healthcare service outside hospitals.

The next step of healthcare ICT is to discuss standardization of security and interoperability with healthcare devices. The trials mentioned in this contribution adopted "on demand VPN" service for ensuring security and privacy, and specification of "Continua Health Alliance" for communicating vital data between health devices and servers in telecommunication networks. In conclusion, it is needed to discuss the standardization in ITU considering of unique colors and real-time capability in medical services continuously.

2.10 Report of ITU Workshop on e-Health Services in Low-resource Settings in Japan

2.10.1 Introduction

[10]In developed countries including Japan, the aging society problem is causing a chronic shortage of doctors. Meanwhile, developing countries also have a chronic shortage of doctors but for a different reason, namely the limited availability of medical services.

Tele-medicine and e-Health are being studied as one solution for these problems, and ITU-T SG16 and ITU-D SG2 study standardizations on e-Health technologies and deploy it widely in developing countries. In November 2012, the ITU and WHO launched a partnership called the m-Health initiative, which aims to use mobile phones to deliver e-Health services to combat non-infectious illnesses. Since April 2012, the ITU-T focus group on machine-to-machine (M2M) service layer called FG-M2M has been studying the standardization of e-Health as an M2M application.

With the aim of ensuring that e-Health standardization proceeds smoothly in the future, the ITU-D and ITU-T held a joint e-Health workshop to provide a place for dialogue and the exchange of information between each of their members. In this way, it was expected to clarify the special requirements of developing countries, and to specify the items for future standardization towards the implementation of e-Health using advanced technology.

This contribution covers brief results of the workshop, and proposes future activities for progressing towards the standardization work and deployment in developing countries on e-Health services.

Photo 1: Opening speech from Vice- Minister of Japan

2.10.2 Overview of the Workshop

Opening speeches were made by Mr Eiichi Tanaka, vice-Minister for Policy Coordination in Ministry of Internal Affairs and Communications, MIC, Japan (Photo 1), and by Mr Sameer Sharma of the ITU Asia-Pacific regional office on behalf of the ITU Secretary-General. These were followed by keynote speeches from Mr Tetsushi Sakamoto, the State Secretary for MIC, Japan, on the subject of Japan's e-Health policies, and Prof. Kiyoshi Kurokawa of the National Graduate Institute for Policy Studies, who gave a presentation under the title of "Global Agenda in Post Fukushima" in which he raised issues that should be addressed not just by Japan but by the whole world in the wake of the Great East Japan Earthquake. Mr Mark Landry of Pacific regional office of World Health Organization, WHO, gave a speech on behalf of WHO in which he

[10] See document RGQ14.3.2-C-0024

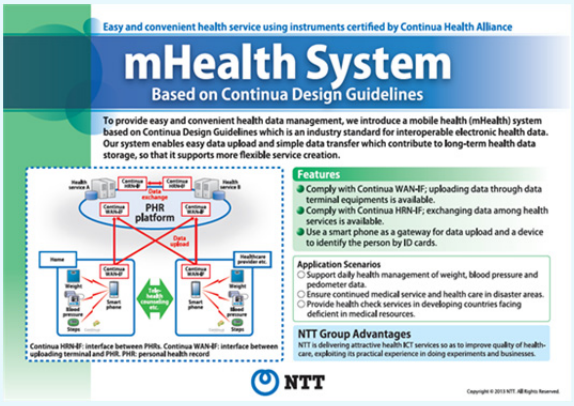
described some examples of e-Health policies across Asia, and the current status of cooperation with WHO (Photo 2).

Photo 2: Workshop

2.10.3 Requirements for Low-resource Settings

On the theme of implementing e-Health with low-resources, representatives from India, Sudan, Uganda, Algeria, the United Arab Emirates, Bangladesh, Vietnam and Myanmar gave presentations on the current situation of e-Health in each country, the issues that need to be addressed, and requirements in each case. The requirements of developing countries are characterized by delayed development of infrastructure, not only for medical care but also for insurance, sanitation and health management, and a shortage of healthcare workers coupled to a poor educational environment. Instead of the advanced e-Health systems that are being considered in developed countries, these presentations introduced solutions such as Web-based sharing and education of medical information, using video conferencing to facilitate collaboration between medical workers including doctors, and using mobile phones for medical consultation (m-Health), whereby e-Health is expected to provide a broad range of benefits.

Photo 3: Demonstrations on m-Health



2.10.4 Items for Standardization

Representatives from Japan, South Korea, Singapore, and the United States introduced some advanced examples of e-Health initiatives, and discussed the challenges of implementing e-Health. NTT Data gave a presentation introducing cases of Personal Health Record, called PHR, management and monitoring as

examples of m-Health services in Japan, and stressed the importance of security and privacy protection. The representative from Singapore introduced a Smart TV health management system based on ITU standards, and showed that interactive e-Health using TV sets and remote control devices may be suitable for an aging society since these devices can be easily used even by elderly people. Also, the US representative introduced the importance of considering e-Health for people with disabilities; NICT introduced the possibility of a body area network (BAN) that people can wear in order to connect to healthcare equipment; and Fujitsu introduced the possibility of a heart simulator that aims to improve healthcare technology. These presentations highlighted the need for standardization of the data structures and protocols required for the transmission of PHR and other data, of the application interfaces and transmission methods used between medical/healthcare devices and telecommunication networks, wireless devices and fixed devices, and of security, which is essential when exchanging PHR data.

2.10.5 e-Health in the Event of Disaster

Experiences from the Great East Japan Earthquake with regard to the use of e-Health in disaster situations were introduced. A&D made a presentation about a monitoring system for information such as blood pressure for health management of people affected by disasters, which was actually put to use after the Great East Japan Earthquake. Professor Isao Nakajima of Tokai University – the vice rapporteur of ITU-D Q14/2 and co-chairman of this workshop – described items that need to be studied in e-Health and radiation related disasters in relation to the nuclear power plant incident. These presentations demonstrated the usefulness of e-Health in the event of disaster, and made a case for the importance of preserving two-way communications.

2.10.6 Future Direction for ITU Work

Mr. Masahito Kawamori of NTT - the rapporteur of ITU-T Q28/16 and co-chairman of this workshop, drew up the following summary of the results of the workshop and the future direction of e-Health standardization at the ITU.

- To promote the spread of e-Health, it is important to provide education in order to eliminate misconceptions about the circumstances of developing countries.
- From the viewpoint of standardization, to establish cooperation between requirements, terminology definitions, data sets/applications, and related organizations.
- In particular, to make a terminology database, since the technical terminology relating to e-Health covers many fields including medicine, healthcare and ICT.
- For e-Health related regions, to study the application of this technology as related to the elderly, stranded people, and disabled people.
- In the future, to supply information to the ITU website including the content of speeches given at this workshop, and to hold an enlightenment event in cooperation with WHO.

2.10.7 Other Related Events

Alongside the workshop, there were also demonstrations from NTT Laboratories related to m-Health (photo 3). A simple health management system was introduced where healthcare equipment including blood pressure gauges and SMS text messaging is used to implement m-Health with low initial investment. In this exhibition, it was found that there are many different opinions regarding this technology.

2.10.8 Conclusion

Over 130 persons from 20 countries attended this workshop (photo 4), since e-Health has been globally recognized as important by developing and developed countries alike. It is expected that this field will continue to grow in the future. For its efficient global development, international standards, with appropriate consideration of the regional characteristics and environmental conditions of each country, are essential.

This contribution proposes to continue dialogue between ITU-T and ITU-D members by using workshop since this kind of workshop is expected to contribute to the expansion of developing countries, which is the scope of ITU-D, as well as the further development of ICT standardization, which is the scope of ITU-T. Furthermore, this contribution also proposes to collaborate with WHO for deployment m-Health solutions to developing countries, along with an MoU signed by ITU and WHO.

To access presentations delivered at the workshop, please visit: http://www.itu.int/en/ITU-T/Workshops-and-Seminars/e-Health/201302/Pages/default.aspx

Photo 4: Demonstrations

2.11 Korea (Rep. of): Case of SK Telecom – SNUH (Seoul National University Hospital) HealthConnect Services

2.11.1 Introduction

[11]Since healthcare costs are rising dramatically due to the aging of population, it can possibly become a huge national burden without a proper preparation. The official launch of HealthConnect marks a good starting point that will lead to the development of a future convergence healthcare technology and innovative medical services. Looking ahead, SK Telecom (incumbent private telecommunication operator) and SNUH (Korea's first national hospital) will work together to research and develop future healthcare models so as to offer the most reliable medical services for the next-generation, increase healthcare consumer satisfaction, and strengthen Korea's national competitiveness in healthcare.

In this case study, information on the joint venture firm between SK Telecom and Seoul National University Hospital is shared.

2.11.2 Stakeholders

The name "HealthConnect" represents convergence between core capabilities of the two companies: SK Telecom's strength in ICT and network operation and SNUH's expertise in medical technology. SK Telecom and SNUH signed a strategic partnership agreement in April 2011 to share their capabilities in healthcare ICT business, to identify specific areas of cooperation, and to develop innovative joint business models by

[11] Contribution: Lim Hyoung-Do, SK Telecom, Korea (Rep. of). See document 2/175

devise measures. After signing the joint venture agreement in October 2011, SK Telecom and SNUH have completed creating the organizational structure such as business, technology, strategy, and new business development of the joint venture firm and recruited necessary employees in just three months. The joint venture is established with a capital of KRW 20 billion or USD 17.6 million. SK Telecom holds 49.5 percent of the stake in the joint venture, while SNUH holds the remaining 50.5 percent.

2.11.3 Main Characteristics of the Services

HealthConnect moves toward the direction of 'disease prevention and health management' and will lead changes through ICT-based innovations. HealthConnect business is defined as three main services: Development of a self-health management service, development of smart hospital solutions to enhance doctor & patient productivity and satisfaction, and establishment of an integrated R&D system for the advancement of the Korean healthcare industry.

First, the development of a self-health management service that links prevention, diagnosis, treatment and management will lead to the provision of truly personalized healthcare service based on one's medical information;

- Seamless Management using Medical Check-up
  - Personalized program based on medical check-up data.
  - Program result analysis.
- ICT based Personalized Service
  - Activity tracker measuring daily activity.
  - Aerobic/muscle motion data gathering at in-company fitness club.
  - Diet calorie measurement at cafeteria.
- Health-tainment
  - Ranking/Incentive to motivate participation.
  - SNS to encourage family/colleague activity.

HealthConnect plans to develop a health management service model centered on wellness in 2012, followed by a pilot service conducted jointly between SK Telecom and SNUH within the same year.

- Pilot Test Summary
  - Participants: SKT Employees (30 members).
  - Selection Criteria: BMI.
  - Duration: Starting in May 2012 (3 months).
  - Measurement: Comparison of medical check-up data and Satisfaction Index before/after pilot test.

Second, HealthConnect aims to develop smart hospital solutions to level up hospital productivity and patient- friendly environment. For instance, plans are ahead for HealthConnect to create a patient-oriented environment by building smart ICT system within hospitals in 2012.

- Smart Reception & Clinic Information
  - Automatic registration of medical treatment for out-patients.
  - Providing medical exam/treatment information based on the clinical pathway and medical contents.
- Smart Payment
  - Payment of small medical bills through NFC enabled smart phones, payment apps and iosk program.

- Smart Indoor Navigation
  - Guide routes to personal destination inside hospital using smart phones and Kiosks.

Besides development of the health management services, SK Telecom and SNUH co-developed Mobile EMR (Electronic Medical Record) and medical self-diagnosis applications in 2011 to accelerate the realization and export of 'Smart Hospital.'

Moreover, the M-prescription application was launched by SK Telecom for mobile healthcare services. M-prescription is expected to significantly enhance patients' convenience by allowing them to store and manage prescriptions on their smart phones and access detailed information on the prescribed medicine including effects, side-effects, dosage and frequency of administration. M-prescription will also help hospitals and pharmacies provide better services and care for patients. Main features of M-prescription include:

- Prescription History.
- Real-time Access to Medication Information & Medication Guide.
- Medication Reminder.
- Search Nearby Hospital/Clinics & Navigation Service.
- General Information on Medicine.

By offering mobile healthcare services that systematically manage an individual's daily amount of physical activity and biometric information, HealthConnect plans to open an era in which individuals are able to manage their own health via mobile phones.

2.11.4 Conclusion

HealthConnect holds a significant meaning in terms of the public healthcare, as it includes services for the medically deprived people and areas. By offering ICT-based healthcare services, HealthConnect will allow people to prevent diseases and manage their health, which will contribute to the overall reduction in social cost and the betterment of national welfare. Furthermore, a portion of its profits will be donated or invested to enhance public healthcare in Korea.

As the pace of adoption of IT in the medical industry has been slower than that of other industries, the combination of SK Telecom's world's top level ICT and SNUH's medical technology and knowhow will develop the next generation healthcare model that connects prevention, diagnosis, treatment and management; promote the export of ICT-based medical services or so-called 'digital hospital'; and enhance Korea's national competitiveness in medical technology and services.

2.12 Singapore: Singapore's e-Healthcare Programmes

2.12.1 Introduction

[12]Singapore experienced rapid population growth in recent years, with the population exceeding five million. This had put a strain on its infrastructure and services. At the same time, Singapore is also facing the prospect of an ageing population where one in five will be over 65 years old by 2030. The national healthcare expenditure is expected to increase and a different pattern of healthcare is necessary; one which features an integrated healthcare delivery system with "right-sited" care, better allocation of resources and more cost-effective treatment and care.

[12] Contribution: Government ICT Strategy and Performance Management (ISPM), Infocomm Development Authority of Singapore (IDA), Singapore. See document RGQ14.3.2-C-0018

2.12.2 Country Overview

Public healthcare in Singapore is governed by the Ministry of Health (MOH). Institutions that deliver subsidised healthcare are publicly funded through subventions and include 7 acute general hospitals and 6 national specialty centres for cancer, cardiac, eye, skin, neuroscience and dental care. In addition, there are 18 polyclinics located throughout the island that provide subsidised outpatient medical care, health screening and pharmacy services. In the next 4 years, there will be 2 new public hospitals providing additional 1000 beds.

The Intermediate and Long Term Care is provided by residential and communities which are mostly outside the public healthcare system though some facilities receive government subsidies.

In 2000, WHO ranked Singapore's healthcare system ranked first in Asia and sixth in the world. IMD (2007) ranked Singapore's health infrastructure third out of 55 countries. These accolades were achieved on a prudent national healthcare expenditure that is within 4% of Singapore's GDP (a low figure among developed countries)

2.12.3 Objectives and Strategies

There had been a shift in focus from episodic care to developing holistic care to patient. The vision is to have "Hospital without walls" where the healthcare team will comprise GPs, nurses, physiotherapists beside the hospital staff. The team will deliver patient centric care through greater collaboration and partnership. Patients can be decanted more effectively in the healthcare system through the "team based care" so that acute hospitals can cater to severe cases and refer patients in recovery to step down care. This will address the capacity issues of acute hospitals especially in the context of an ageing population.

The National Health Informatics Strategy was conceptualized in 2008 with the goal of achieving greater coordination of healthcare across different providers for patients, higher adoption of Electronic Medical Record systems (EMR) amongst healthcare providers and integrating these EMRs to achieve a vision of "one patient, one medical record" in Singapore. A key part of this strategy is to develop a shared Electronic Health Record which makes available summaries of clinically relevant patient information to healthcare providers to improve the overall quality of care rendered to patients when they seek healthcare services at different points of care throughout their lives. National Electronic Health Record (NEHR) Phase 1 was implemented by 2011 as one of the key guideposts for Singapore's longer term "One Patient – One Medical Record" vision. More capabilities to support clinician collaboration across care setting, harness the power of data via analytics as well as expansion of NEHR adoption across the entire healthcare continuum will be the focus from 2012 to 2016.

In addition, the iN2015 Masterplan by the Infocomm Development Authority (IDA) set out a 10-year plan to utilize infocomm technologies to establish a well connected society. For the healthcare sector, personalized healthcare delivery was a future envisioned to be enabled by infocomm to achieve high quality clinical care, service excellence, cost-effectiveness and strong clinical research.

2.12.4 Activities Implemented

MOH did a review of healthcare landscape and had implemented a concept known as Regional Health System (RHS). There are six RHS formed to serve the different geographic locations in Singapore. The RHS realised the vision of "Hospital without Walls" by providing integrated care to patients. The RHS will involve an acute hospital as anchor to work closely with key healthcare providers in the region i.e. General Practitioners and step down care providers such as community hospitals, nursing homes and hospices. Together, the institutions were to take a patient-centric approach, as opposed to the traditional institution-centric approach. To support the RHS concept, there will be a need to improve the healthcare ICT capability especially in the area of connectivity between institutions. NEHR will be used as a common reference to Patient Record.

2.12.5 Technologies and Solutions Deployed

National Electronic Health Record (NEHR)

To improve healthcare quality for all residents, increase patient safety, lower healthcare costs and develop more effective health policies, Singapore's Ministry of Health (MOH) created the National Electronic Health Record (NEHR) vision – "One Singaporean, One Health Record".

The NEHR extracts and consolidates in one record all clinically relevant information from the patient's encounters across the healthcare system throughout his/her life. It allows for data sharing, making it accessible to authorised healthcare providers, across the continuum of care throughout the country.

With the NEHR, healthcare teams would be better equipped to provide more effective care as the system will enable more timely access to health records including diagnoses, prescriptions and allergies. This will help reduce medication errors and adverse drug events. There will also be cost savings as healthcare staff will be able to obtain a more complete and accurate picture of the patient's health history and therefore avoid ordering duplicate or unnecessary tests.

Integrated Clinical Management System (CMS)

Launched in 2006, the Integrated Clinic Management Systems (CMS) program aims to encourage GP clinics to adopt and leverage on infocomm technologies to facilitate operations and clinical improvements in their patient care. The integrated CMS facilitates scalability of the GP infrastructure by enabling consistent and standards based interface with different healthcare provider systems. Secured and seamless information flow will allow GPs to plan the patient's treatment in an integrated and coordinated manner with other hospitals and step-down care providers. Through this program, GPs will have the capability to easily plug into the national healthcare network and achieve MOH's "One Singaporean, One Electronic Medical Record" vision.

GP-IT Enablement Programme

Building on the momentum of the CMS Program which has resulted in most GPs having some form of IT system in place, the GP-IT Enablement Program was conceptualized in 2010 as the next phase of GP IT adoption. It aims to support more sophisticated IT usage for GPs through introduction of an IT-enabled clinical foundation that contains linkages to the National Electronic Health Record (NEHR) and care services such as laboratory and diagnostic radiology results. GPs currently participating in the CMS Program will be transited to the IT-enabled clinical foundation when the system is implemented.

Intermediate and Long-Term Care (ITLC) IT Enablement Programme

The ILTC sector comprises residential and community-based services and is currently managed mostly (approximately 70%) by voluntary welfare organisations (VWOs), where resources are usually stretched, clinical documentation capability or management is limited, IT usage is minimal and IT expertise a scarce occurrence. To address these issues, the ILTC Programme consists of an IT strategic framework that aims to establish the core foundation for the use of technology across ILTC settings, for operational efficiency, and subsequent electronic exchange of information between care settings within the ILTC sector and nationally to the National Electronic Health Record (NEHR). In addition, an ILTC IT Adoption Model will be developed to categorise the IT adoption of different care facilities, to allow policy planning to better develop specific programmes to meet the needs of care facilities with similar maturity levels, and to increase industry interest in the ILTC sector to explore more innovative & sustainable solutions and develop more targeted products and services for the care providers and care givers.

Telehealth Programme

With the increasing challenges of the healthcare sector, Singapore needs to explore more innovative ways to deliver healthcare services, and Telehealth is one such area. Telehealth is an area where ICT can improve the delivery of healthcare services and where the ability of patients to be more proactive in their health management can be enhanced, thereby increasing care accessibility, enhancing care quality and

delivery, and bring more affordable care through greater operation efficiency. It aims to empower patients to better self-manage their health while collaborating with healthcare providers to ensure care continual.

The Telehealth Programme has been formulated to identify and develop remote healthcare services via ICT including mobile technologies in an affordable and sustainable manner for both patients and healthcare providers. Through this programme, it aims to increase greater Telehealth adoption through more coordinated efforts and optimized investment across the entire healthcare ecosystem.

The programme will drive the development of a Telehealth framework which will establish a tripartite relationship between the patients (with their care givers), healthcare providers, and technology as the necessary bridging platform, with an overarching governance to provide implementation guidance and oversight. It includes development of needs assessment and implementation guidelines, thus aligning and synergizing the various initiatives across the healthcare sector including institutions, government agencies and industry.

2.12.6 Changes and Outcomes Achieved

National Electronic Health Record (NEHR)

Phase 1 of NEHR completed in Jul 2012 with common patient records available to all public acute care hospitals, specialist clinics, polyclinics, selected GP clinics, five community hospitals, two nursing homes, one hospice and supporting organizations like Agency for Integrated Care (AIC), Health Promotion Board (HPB) and Singapore Armed Forces medical corps. Phase 2 of the NEHR will provide additional features and functionalities to support patient care and data analyses.

GP-IT Enablement Programme

CLEO (Clinic Electronic Medical Record and Operations), a national system developed for the primary care will comprise of an EMR and an integrated CMS (clinic management system). Phased rollout is expected to begin from 2013.

IDA had awarded a grant to Quest Laboratories to develop a system that delivers secured, electronic lab results online and to NEHR (via the General Practitioner Clinic Electronic Health Record and Operations or CLEO) that comply to the Singapore HL7 standards for messaging and LOINC international standards for diagnostic results. The system will transform a traditional, paper-based process of GP practice to one that is IT-enabled, offering timely and comprehensive electronic documentation of a patient's health condition when integrated with NEHR. It will also leapfrog Singapore's status as one of the few countries in the world with such high level of IT sophistication in pathology services. The system will be completed by March 2013.

Telehealth Programme

MOH Holdings (MOHH) had established a programme office (Consumer Health Office) to oversee the programme. As part of the programme, Integrated Health Information Systems (IHIS), a subsidiary under MOHH, had also established a Telehealth Technology Office (TTO). The TTO will build (when necessary), implement, operate and support Telehealth solutions. By aligning and consolidating potential Telehealth initiatives across the clusters and community, TTO will assist institutions to achieve economies of scale through consolidated procurement, therefore optimising the limited manpower and financial resources.

MOHH has recently completed a local landscape study of Telehealth implementations by the different healthcare institutions. The study seeks to understand the major pain points and barriers to adoption of Telehealth. The results of the study will help to guide the programme office in developing the framework for assessing and regulating Telehealth.

IDA had launched the Telehealth Call For Collaboration (CFC) earlier in March 2012 to invite the industry to develop new models of distance care for the elderly - at home, within the community or at institutions such as nursing homes - assisted by ICT. Launched in collaboration with the Ministry of Health, it is hoped

that the CFC will encourage healthcare providers to review existing care models and care processes, to ensure sustainability through appropriate change management, manpower training and benefits measurement and demonstrate viable business models for longer terms deployment of Telehealth services. It is predicted that Telehealth will be a key enabler behind strategies that are being adopted to enable "ageing-in-place" as Singapore prepares itself for a rapidly ageing population. Results of the CFC will be announced in early 2013.

2.12.7 Challenges and Success Factors

National Electronic Health Record (NEHR)

As there are six clusters and over 30 institutions in Singapore, it is a challenge to take in the data, process and display accurate and meaningful data. The implementation of the NEHR system has provided an even stronger spotlight on issues such as standards and data quality, as previously unknown inconsistencies and data defects from a variety of catchments flow into a unified record. The data includes information which is non-clinical such as information used to identify people, organizations, locations and departments etc. A national strategy was developed to govern the creation, implementation and management of standards in health information exchange.

The journey and results of any delivery are predictable if the challenges ahead were identified and dealt with. When deploying the NEHR to new institutions, the project team was able to re-use product, process and people, supported by tried and trusted methods.

Telehealth Programme

There were a number of telehealth projects led by the various health institutions. These initiatives include; National Healthcare Group (NHG) Diagnostic's remote radiology reading service, and Khoo Teck Puat Hospital (KTPH) nursing home-geriatrician video-consultation initiative. These projects demonstrate that effective and clinically-led sustainable Telehealth is possible in Singapore. There was however challenges that will need to be tackled such as lack of sustainable business models, clinician support being hampered by liability. Other concerns such as lack of IT infrastructure, patient billing, provider reimbursement issues, security and privacy concerns, and lack of standards will need to be addressed as well.

The challenges will be systematically addressed by the MOHH Consumer Health Office. For example, to address the business model and sustainability issues, the project assessment criteria will include the presence of a viable and validated business model.

Unlike other countries where telecommunication infrastructure is a key barrier, Singapore is well equipped for adoption of Telehealth given our high mobile penetration, excellent network connectivity and high speed broadband, and increasingly empowered population. Coupled with clinical leadership and commitment, Singapore can push towards greater Telehealth adoption across the care continuum and position as a Telehealth thought-leader within Asia Pacific.

2.12.8 Lessons Learned and Next Steps

NEHR

The full implementation of NEHR is an iterative one and will take years to complete, allowing each deployment cycle to refine and improve on the previous one.

Singapore's adoption of the NEHR will change the healthcare landscape in the country for the better. The NEHR is a journey to transform the mindset of healthcare providers and patients, so as to bring about better quality care. Once the NEHR is fully implemented, the possibilities of future development in areas of prevention and treatment are vast. In addition to contributing to high quality care and service excellence, the NEHR will bring us closer to achieving our vision of "One Singaporean, One Health Record".

NEHR Beyond Acute Hospitals

IT implementation and adoption strategies for the intermediate and long term care (ILTC) and primary care sectors are being developed. While the IT adoption rate is still low at the primary care level, IT enablement among GP practices and Community Hospitals will progress with linkages to the NEHR.

The use of IT will enable patients' critical medical information flow from the acute hospitals to the primary and intermediate long term care sectors. There will be support for Community Hospitals (rehabilitation hospitals) to modernise patient administrative, pharmacy and clinical systems. Upgrading, enhancing and improving of systems in nursing homes, day rehabilitation centres and home nursing providers are also underway.

In the long run, healthcare providers will be able to better develop, integrate and coordinate shared care plans to provide better quality care. The end goal is for patients to enjoy a hassle-free healthcare delivery service, with fewer repeat tests and reduced medication errors when they move from one care setting to another, with the NEHR linking up providers in the community who currently do not have electronic access to patients' medical records.

For patients, it means better prescribing practices, reduced waiting times and better management of the quality and cost of healthcare by ensuring the most appropriate care setting for their conditions.

Telehealth Programme

Over the past few years, there have been multiple efforts in Telehealth exploration by various healthcare institutions and government agencies; with varying results. These range from government-funding programmes such as IDA Yr 2006 CFC to ground-up institutional initiatives such as video conferencing partnerships. However, these efforts are largely sporadic and relatively unsustainable. One key factor was an overall lack of coordination in pushing forward the adoption and innovative use of Telehealth in Singapore. As such, it is hoped that the establishment of a Telehealth framework will help coordinate the various Telehealth efforts and guide its implementation.

The Telehealth Framework aims to identify services that will deliver remote healthcare services via ICT including mobile technologies in an affordable and sustainable manner for both patients and healthcare providers. Through this framework, it will set the directions for Singapore Telehealth adoption across the entire healthcare ecosystem and identify low-hanging or high-potential areas to which more coordinated efforts and investment can be delivered.

This will also establish a consistent assessment framework for Telehealth efforts, thus aligning and synergizing the various initiatives across the healthcare sector including institutions, government agencies and industry. As part of the framework, a set of implementation principles will be developed to help guide the implementations and facilitate subsequent best practices sharing.

2.13 China: Perspective for e-Health Using Satellites

1 Concept of e-Health Using Satellites

[13] E-health is medical activity by cooperation of medical institutes in different areas, which is realized by computer technology and telecommunication technology. Typical solution of e-health is by satellite communications system, ISDN or telephone facilities. In an e-health system using satellite, the communication links are realized by satellites, in despite of the disadvantage of e-health using terrestrial facilities. Typically, an e-health system using satellite is comprised of a telecommunication satellite, main teleport, a quantity of terminals, related software and protocols.

[13] See document 2/332

2 Advantages of e-health using satellites

- Larger service area: Satellite communications system could provide large coverage that even rural and wild areas can be included, so the problem of sharing and equity of health resources in developing and developed areas are easier to resolve.
- Wide bandwidth: Until now, the bandwidth of one channel of broad band telecommunication satellite could reach as much as 200 MHz, it is a big advantage comparing to the bandwidth of terrestrial communication systems, especially in developing countries.
- Flexibility and extensibility: No matter it is in deserts, oceans, mountains, or hills, an e-health system is possible to be operated if it's in the service area of a satellite.
- Hard to break down: Terrestrial communication systems are always destroyed when disasters such as earthquake or tsunami happens. At this time, e-health systems based on satellites is the only communication way for rescue and rebuilding in disaster area.
- Cheaper, shorter construction period: Compared to other communication system, the prices of system infrastructure and user terminal are cheaper, the constructing is easier and its period is shorter.

3 Application Scenarios of e-Health using Satellites

3.1 Point-to-Point Health Service

In a point-to-point health service, experts could use health data collecting and diagnosing devices, such as digital imaging instrument, ultrasonic detection automatic recording instrument, to collect high resolution CT scanning figures, X-ray images. In the diagnosing process, real-time telecommunication is feasible. Despite of remote diagnosing, doctors could use remote control system to operate mechanic arms to conduct a surgery, in which the communication link is built by satellites.

Once consultation is needed, video conference may be supported by the point-to-point health system. Using satellites communication links, any terminal could be used as the main terminal and the other terminals are used as sub-terminals. Any links between different terminals are in two-direction pattern. Real-time connection is realized between them and in this way medical institutes in different sites could deal with business simultaneously.

3.2 Education for e-Health

In disaster or epidemic areas, an e-health system by satellites could improve the medical level much rapidly. For example, one expert provides lectures at the main terminal and other people could receive information and reply by their local terminals. By this way, some emergent knowledge about first aid and epidemic prevention is transmitted and broadcasted.

3.3 Data and Information Sharing for e-Health

In every dispersive area, hospitals can found local information centre and expert database, collect local health requirements and upload them to expert service centre of e-health system. The expert service centre of e-health system could provide proposals and methods according to the requirements and realize the sharing of software and data through health information broadcasting by satellites.

3.4 Proposal

Huge investment is needed for any space telecommunication system, and permanent maintenance is also necessary. For a developing country with limited financial ability, it's a good way to build up its e-health system using satellite according to the specified situation in this country.

In primary phase, it's better to build up an e-health system by renting transponders of civil or other countries' satellite. When the requirements are mature and the fund is sufficient, one country can build up a new satellite system aimed at public service, in which e-health is one of the main purposes.

The scale of satellite multimedia service is increasing all over the world, so are the user's requirements. Under this situation, broad band satellites technology is becoming one of the trends of satellite telecommunication in the future. By the way, it's necessary to consider the compatibility between current satellite facilities and the future satellite system, such as the broad band satellite system.

It is suggested to conduct the satellite hardware construction, the telecommunication system research, and business mode exploring synchronously.

2.14 India: Setting up of Rural Tele-medicine Network in Developing Countries

[14] The contribution is a case on implementation of Tele-Medicine project through Pan – African E-Network Project by M/s Telecom Consultants of India Limited, a Government of India Enterprise. The project has been very successful and won several awards for innovation. This model could be used as an example for providing Health services through ICTs in the developing countries.

1 Introduction/Background: TCIL Experience of Design, Development and Operations of Tele-medicine Networks

TCIL has implemented and operating Tele-education and Tele-medicine network projects of pan African e-Network Project, wherein 5 reputed Indian universities and 12 Indian super specialty hospitals are connected to 48 of the 54 member countries of African union for providing Tele-education and Tele-medicine. TCIL is implementing agency on turnkey basis covering design, development, supply, installation, commissioning and operations of the network.

The network is operating for more than 5 years and African countries have benefitted from the medical expertise and know how in India via this network. The CME sessions conducted from India on daily basis have helped the medical professionals in education and sharing of experiences. TCIL is implementing agency on turnkey basis covering design, development, supply, installation, commissioning and operations of the network including providing education and medical services through the Indian universities and hospitals. TCIL has also implemented SAARC telemedicine network spread across for the SAARC nations.

Pan African e-Network Project has been awarded of "Best Development Initiative in Africa – 2009" and "Hermes International Award for Innovation".

2 TCIL Proposal

The aim of this service is to provide health checkups and diagnosis for non-emergency medical conditions and thus eliminating the need to travel to cities for treatment of minor ailments. This service would enable the rural population to demand medical services at their door steps. A medical call center would be established which can be contacted over a toll free number. This service would bridge the gap between the rural population and specialty medical care and thus benefitting both.

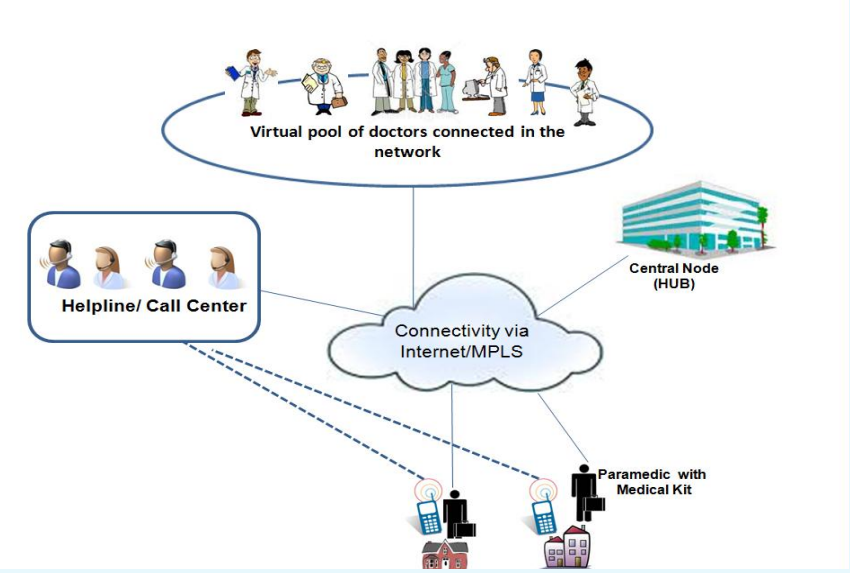
These services would be provided either through paramedics or general practitioners. Medical Diagnostic kit can help in providing the Frontline Health worker to perform diagnostics tests and then employ decision support system to offer care to all primary care patients. In the case of emergency or situations where further consults are required, the medical officer can use the Satellite or Broadband connectivity to offer telemedicine facility.

Paramedics are one of the first points of contact for many populations. Empowering them with Medical Diagnostic Kit, the on-the-spot recommendation system and guidance by physicians through the phone/videoconferencing will allow them to monitor patient health and also identify high risk cases which

[14] See document 2/INF/87

need immediate care by physicians. In this way, such a system could help better care delivery and a more efficient system for rural population.

Figure 33: Rural tele-medicine network



Workflow of the rural tele-health services

1 Services shall operate through the call center for providing the medical assistance to the patients in the rural areas.

2 Call Center would be equipped to receive the help calls by following means:

a. Helpline telephone numbers;

b. Web-based access.

3 Residents can register their requests for medical services by approaching the call center by available communication means.

4 The call center shall alert the paramedic near to the location of the caller or service seeker and forward him the request details for attending the patient.

5 Paramedic is equipped with sufficient diagnostic equipment to examine the patient.

6 Paramedic on examining of the patient shall report the details through internet and seek an appointment with a doctor from Primary Health Centers (PHCs).

7 PHCs doctor list and contact details would be available in the data base and paramedic can contact the doctor of the particular PHC for getting medical support.

8 The entire diagnosis and medical history shall be available to the doctor by accessing the central server.

9 Doctor shall provide the necessary prescription online into the system which shall also be available to paramedic for handing over the same to the patient.

10 The medicine shall be arranged by the patient separately from PHCs or chemists.

11 The Call Center and Data Center would be located at a mutually agreed upon location.

3 Proposed Technical Solution

Components of the rural tele-medicine solutions and their roles for delivery of rural tele-medicine services:

a) Role and responsibilities of 24X7 Toll free helpline/call center

i. The patients from rural areas can call the helpline for immediate medical assistance for an emergency or to request for a health checkup. Depending on the call it may be forwarded directly to a physician for immediate advice.

ii. Initially a call center with a staff of 5 agents and 2 doctors may be setup for the pilot project. The call center's call handling capacity would be increased as per the increase in the call traffic.

iii. The call center would inform the callers about the schedule for paramedic staff visiting their area and also accept request for health checkup.

b) Role and responsibilities of paramedic staff

i. Paramedics would be hired to travel to various regions of the targeted area to provide health check up and medical assistance. Paramedics would be equipped with a medical diagnostic kit and medical vehicle to carry the patient to a Specialty Hospitals if required.

ii. As per the requests for health check up received, a paramedic staff would visit the concerned patient.

iii. The paramedic visiting a patient would prepare and upload the EMR online on the central server.

iv. The paramedic would also transfer the medical reports generated over the medical kit to the centralized server.

v. The paramedic can also communicate with a specialist using the medical kit's Video Conferencing facility.

vi. Paramedic staff would be provided with a mobile phone with GPS facility.

c) Role and responsibilities of primary healthcare centres

i. Primary health centers may play a key role in this network. They may also initiate a call to the call center for tele-consultation with a specialist as needed. They may also act as the health checkup center when the paramedic with medical diagnostic kit arrives in that area.

ii. Primary Health Centres may also appoint doctors to take calls from Paramedic Staff and to assist them remotely.

d) Role and responsibilities of doctors in the virtual pool

i. A pool of doctors from various Primary Health Centres would be enabled to connect in the network over internet.

ii. These doctors would help the paramedic personnel in the rural area visiting the patient and give a prescription.

iii. The doctors would be able to see the Patient record online from login into the Central Server.

e) Medical kit

The medical kit is a revolutionary device that enables remote diagnostics and care employing state of the art mobile system. It would allow any Android Phone or Tablet to perform following diagnostics tests:

i. Blood Pressure.

ii. Blood Sugar.

iii. Heart Rate and Heart Rate Variability.

iv. ECG.

v. Urine Protein.

vi. Urine Sugar.

vii. Blood Hemoglobin.

viii. Body Temperature.

4 Stakeholders

– ITU.

– Participating interested countries.

– TCIL as implementing agency for the project.

– Participating Hospitals for delivery of Tele-medicine sessions and CME programs.

– Beneficiaries patients.

5 Approach for Project Implementation

Approach and methodology:

After intent of countries to implement Rural Tele-medicine network, TCIL shall carry out detailed meetings into the country for implementation of the Rural Tele-medicine solutions whereby it will do the following:

– TCIL shall identify in association with stake holders the Medical treatments at site to be covered, identification and finalization of Super Specialty Hospitals, Primary Health Centres etc. for delivery of Tele-medicine services.

– TCIL shall carry out a sample survey of few locations.

– TCIL shall design the network for setting up the required infrastructure.

– TCIL shall finalise Bill of Materials (BoM), Bill of Quantities (BoQ), availability/ coverage of public network etc.

– TCIL shall develop the framework of implementations of Tele-medicine as per the countries requirements.

– TCIL shall train the countries' manpower for operations & management of the network.

– A project monitoring team will monitor the different activities of the project.

Responsibility of countries:

– Network for Tele-medicine such a leased lines, internet, MPLS shall be provided by the interested country.

– Space, power/electricity shall be provided by respective countries.

– Site preparation shall be provided by the respective country.

– Man power for operation and maintenance shall be provided by the respective countries.

– Any other local assistance regarding clearance, Visa, survey etc.

– Exemptions such as taxes, custom duties will be provided by the country.

– Day to day Consumables at respective sites will be provided the respective country.

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For more details on Pan African E Network Project: http://www.panafricanenetwork.com/

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Annex III: Compendium of e-Health Projects for RMNCH Implemented in CoIA Countries

	e-Health project	Description	ICT application	Country
1	**e-Districts Project for services of births and deaths registration in district of Kapurthala, India**	**Integrated electronic service** supported by automation workflow, backend computerization, and data digitalization. The objective is to ensure that the defined process of service delivery of birth/death certificates is adequately and timely followed. http://pbhealth.gov.in/e-district.crs.pdf	Civil Registration Health Management Information System (HMIS)	India
2	**MAMA**	**Mobile-based information** to new and expectant mothers. http://www.babycenter.com/mama	SMS-based Public Health Information and Education	Bangladesh South Africa India
3	**MOVE IT**	**Mobile-based registering** of pregnancies, recording of births, deaths and cause-of-death, using **text messaging** system. http://www.who.int/healthmetrics/news/MOVE_IT_Africa_Board_Paper_21.2.12.pdf	Civil Registration	Ghana
4	**Project Mwana**	**Mobile application** based on RapidSMS, used by community health workers (CHWs) to register new births and monitor community health events related to malaria, diarrhoea, and immunizations in children under five years old and expectant mothers. http://projectmwana.posterous.com/	Civil Registration	Malawi
5	**Universal Birth Registration**	**Mobile birth registration system** focused on informing and educating the public about the birth registration processes. http://plan-international.org/birthregistration	Civil Registration	Liberia
6	**Aceh Besar midwives**	**Mobile phones** to improve the quality of health services and reinforce positive health behaviour change, such as child spacing. http://www.mobileactive.org/files/file_uploads/final-paper_chib.pdf	SMS health education	Indonesia
7	**AMUA**	**SMS** is used to send monthly service reports for 12 services in a single text, using a numeric code. Data can be viewed on a **Web-based real time reporting system**, and exported as PDF or CSV files. http://mariestopes.org/ShowContent.aspx?id=430	Health Management Information System (HMIS)	India

	e-Health project	Description	ICT application	Country
8	**ChildCount+**	**Mobile application** based on **RapidSMS** to monitor children under five years old. http://www.childcount.org/	m-Health for data collection Community-based healthcare delivery	Kenya
9	**CycleTel: Family Planning via Mobile Phones**	**Standard Days Method** (SDM) displayed directly to a user's **cell phone**. SDM is a fertility awareness-based method that requires the user to avoid unprotected sex during days 8-19 of her menstrual cycle. http://www.coregroup.org/storage/CycleTel_mHealth_WG_Jan2011-1.pdf	SMS-based Public Health Information and Education	India
10	**e-IMCI**	**Electronic job aid on PDA** to improve adherence to the Integrated Management of childhood Illness (IMCI) protocols. http://www.d-tree.org/our-projects/imci-tanzania/	Point-of-care support and diagnosis	Tanzania
11	**mCare**	**Mobile phone** and **database technologies** used to improve registration and monitoring of pregnancies, as well as neonatal and post-partum care. http://www.mobileaware.com/solutions/mobile-self-service/	m-Health for Data collection Community-based healthcare	Bangladesh
12	**M-CHANJO**	**Mobile health application** that seeks to reduce the rate of child mortality. The system works by sending automated reminders via **SMS** to parents to keep them informed on any future immunization dates and appointments for their children. http://mchanjo.org/	Child Death Surveillance SMS health education and reminder	Kenya
13	**Medic mobile (Frontline SMS)**	**Mobile-based technology** to bridge between patients and physician, mainly for family planning and maternal and child care services. http://medic.frontlinesms.com/	Patient monitoring	Bangladesh
14	**mUbuzima**	**Cell phones** are used to enable community health workers (CHWs) to provide real-time data concerning community health indicators. http://mubuzima.gov.rw	Data collection	Rwanda
15	**SMS alerts for Infant vaccinations**	**e-Vaccination Alert System** connected to 'Hospital Kiosks' where parents register the birth of their child. Alerts on vaccination dates and details on their importance will be automatically sent to the **mobile phone** numbers of parents. http://www.healthunbound.org/content/sms-alerts-infant-vaccinations	SMS health education Point-of-care support	India

	e-Health project	Description	ICT application	Country
16	**AMANECE**	**Mobile phones** are used to detect warning signs and typical symptoms of high-risk pregnancies, to support primary health workers in providing monitoring and follow-up for high-risk pregnancy cases, and to ensure timely obstetric and newborn care interventions. http://www.salud.carlosslim.org/SoluInte/amanece/Paginas/AMANECE.aspx	Patient monitoring Point-of-care support and diagnosis	Mexico
17	**ASARA-HMRI**	**Telemedicine** pilot project aimed at reducing maternal mortality among remote tribal women. http://www.hmri.in/oursolutions-telemedicine.html	Remote monitoring Diagnosis and treatment support	Kenya
18	**BabySMS**	**Free SMS**-based pregnancy advice service to help raise awareness and encourage expectant mothers to attend clinic visits regularly. http://babysms.mobi/index.php	SMS health education SMS reminder	South Africa
19	**Cellphone4HIV**	**SMS** is used to expand the uptake of HIV testing and follow-up in PMTCT. http://www.cell-life.org/	Patient monitoring and support SMS health education	South Africa
20	**Changamka Medical Smart Card**	**Smart Card** provides sustainable financing for delivery, and post-natal services at participating facilities. http://changamka.co.ke/	Mobile financial services	Kenya
21	**CommCare**	CHWs use **electronic forms** to access real-time guidance through key counselling points, decision support, and simple referral algorithms. http://www.CommCareHQ.org	Health Management Information System (HMIS) Patient monitoring Point-of-care support and diagnosis	17 countries in Africa, Asia, and America
22	**CliniPak**	**Automatic text message reminders** for patients receiving ongoing treatment and for mothers requiring post-natal care for themselves and their infants. http://www.vecnacares.org/technology/index.shtml	Point-of-care support and diagnosis Medication reminder	Kenya
23	**E-HealthPoint**	**Tele-medical services** providing referrals to district-based hospitals for situations like childbirth, acute trauma, heart attack, cancer, and accident related emergencies. http://www.ehealthpoint.com/	Patient monitoring Point-of-care support and diagnosis	India
24	**FANC**	**Short Messaging Service (SMS) platform** that allows for two-way exchange of key FANC messages between health personnel and pregnant women. http://www.fanc-africa.org/	SMS health education	Kenya
25	**GlobalMama**	**Blog** dedicated to maternal health. http://blogs.medscape.com/mhtfglobal	Health education	Global

	e-Health project	Description	ICT application	Country
		mama		
26	**HealthLine**	**Toll-free number** for health workers to learn about a variety of topics through audio transmission in native language. http://www.cs.cmu.edu/~healthline/	Health helplines	Pakistan
27	**Health Systems 20/20**	**Mobile based financial services** for interventions in financing, governance, operations, and capacity building to strengthen health systems. http://www.healthsystems2020.org/	Mobile financial services	Global
28	**inSCALE**	**Mobile based system** to improve support supervision, data submission with automated individual feedback and regular motivational messages on how to improve performance and appropriate treatment of children. http://www.malariaconsortium.org/inscale/pages/implementation-sites/uganda	Health education	Uganda Mozambique
29	**Jaroka Tele-Health care Services for Lady Health Workers**	Mobile platforms to extend (1) tele-healthcare based services including **SMS**, **MMS**, **GPRS/Edge** and **VSAT**, (2) medical advice to LHW in the field by connecting them to a network of specialists. http://tele-healthcare.org/implementation/jaroka-tele-healthcare-in-rural-mardan/	Telemedicine Point-of-care support and diagnosis e-Diagnosis	Pakistan
30	**KimMNCHip**	**Mobile** health initiative to offer pregnant women in Kenya more choice, control and care during their pregnancy, and improved medical care for women and their babies during and after delivery. http://www.ghf12.org/?p=2154	Patient monitoring Point-of-care support and diagnosis Maternal and Child Death Surveillance	Kenya
31	**mDhil**	Health information via **SMS** as well as original health **videos** viewable on mobile phones, including maternal health. http://www.mdhil.com/	SMS health education	India
32	**MoTech**	**Mobile based health system** improving management patient data, improving worker performance, and providing last-mile supply chain and patient adherence. http://www.grameenfoundation.org/what-we-do/technology/mobile-health	m-Health for CHW Training Data collection Diagnosis and treatment support	Ghana
33	**Pesinet**	**Mobile phone**-based system monitoring information on mother and child health. http://www.pesinet.org/	Maternal and Child death surveillance Monitoring and evaluation	Mali

	e-Health project	Description	ICT application	Country
34	**RAFT**	**Tele-expertise, ultrasonography** with remote supervision by specialists, particularly for supporting diagnosis for pregnant woman, and collaborative development of educational on-line material. http://raft.hcuge.ch/	Remote monitoring e-Diagnosis Patient monitoring and support Monitoring and evaluation Health Education Point-of-care support	Congo-Brazzaville + 17 countries in Africa
35	**RapidSMS**	**SMS** based system to track pregnancies and support maternal, neonatal and early child health. http://rapidsms.moh.gov.rw/	Monitoring and evaluation SMS reminder	Rwanda
36	**RHEA**	**Health information system** to improve maternal and child care in Rwanda at health centre level. http://rhea.jembi.org	Monitoring and evaluation	Rwanda
37	**SHINE**	**Web and mobile-based** system addressing the data management needs of doctors, nurses, midwives and allied health professionals. https://www.shine.ph/	Data collection Health Information System	Philippines
38	**SMART**	**Small battery-operated printers** program to receive and print early infant diagnosis test results to strengthen early infant diagnosis services by speeding up results delivery and treatment eligibility. http://www.sms2printer.co.uk/pages.php?pageref=clinton-foundation_3	Diagnosis for treatment support Monitoring and evaluation	Mozambique Papua New Guinea Cameroon Zimbabwe Tanzania Ethiopia Malawi Kenya Uganda
39	**SMS Tech for Health txt4Enat**	**Mobile based system** to inform women about pregnancy and collect information transmitted via the handsets to a **central computer system.** https://smsinaction.crowdmap.com/reports/view/162	Point-of-care support Monitoring and evaluation	Ethiopia
40	**Text4baby**	**SMS** based system providing new and expectant mothers with information. http://text4baby.org	SMS health education	Global
41	**TulaSalud**	**Telemedicine and mobile phones** for remote diagnostic and decision-making support from physicians in urban centre and receive calls from people in communities seeking for care. http://www.tulasalud.org	Telemedicine m-Health for CHW Training	Guatemala
42	**UNICEF Reminder Mother System**	**Mobile phones** to increase antenatal care and prevention of mother to child transmission by educating communities. http://www.texttochange.com	Health education SMS reminder	Uganda

	e-Health project	Description	ICT application	Country
43	**Wawared**	**Mobile technology solutions** to support maternal and child care by improving access to health services for low-income pregnant women. http://www.wawared.andeanquipu.org/	Diagnosis and point-of-care support Monitoring and evaluation	Peru
44	**Wazazi Nipendeni**	**Free SMS service** for expectant mothers and families that provides appointment reminders and tips on keeping mothers and newborns healthy. http://www.texttochange.org	SMS Health education SMS reminder	Tanzania
45	**Wired Mothers**	**SMS** reminders to pregnant women for care appointments. http://www.enrecahealth.dk/archive/ffuproposal09wiredmothers.doc/	SMS reminder m-Health for CHW Training	Tanzania

Annex IV:Composition of the Rapporteur Group for Question 14-3/2

Question	Title of the Question/Role	Name/Country/Organization	Focal Point
Question 14-3/2	**Information and Telecommunications for e-Health**		**Mr H. Eskandar**
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	Vice-Rapporteur	Mr Arikan Dalkiliç, Türk Telekom Group, Turkey	
	Vice-Rapporteur	Mr Turhan Muluk, Intel Corporation, United States of America	

Annex V: Glossary

EC – European Commission

EU – European Union

GDP – Gross Domestic Product

GNI – Gross National Income

ICT – Information and Communication technology

IMF – International Monetary Fund

IT – Information Technology

ITU – International telecommunication Union

ROI – Return of Investment

TSA – Telecare Services Association

UN – United Nations

UNDP – United Nations Development Programme

WHO – World Health Organization

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