国 际 电 信 联 盟

第14-2/2号课题
最后报告

ITU-D 第2研究组 第4研究期(2006-2010)

第14-2/2号课题：

电信在电子卫生领域的应用

ITU-D 研究组

2006 年世界电信发展大会（WTDC-06）根据第 2 号决议（2006 年，多哈），保留了两个研究组，并为它们确定了研究课题。WTDC-06 通过的第 1 号决议（2006 年，多哈）规定了研究组应遵循的工作程序。在 2006-2010 年期间，第 1 研究组受托开展电信发展战略和政策领域九个课题的研究工作。第 2 研究组受托开展电信业务及网络和信息通信技术应用的研发与管理领域十个课题的研究工作。

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电信在电子卫生领域的应用

前言

数十年来，国际电联电信发展局围绕在发展中国家的卫生领域发挥电子卫生和远程医疗解决方案及服务的潜在效益这一主题开展了各种研究活动，同时，为展示这些应用，在不同国家实施了多个示范项目。

按照 2006 年世界电信发展大会在多哈（卡塔尔）做出的决定，电信发展局开始了对移动卫生保健的研究。ITU-D 第 2 研究组第 14 号课题的主要目标即被确定为移动电子卫生保健。

在 2008 年 6 月于日本召开的有关第 14 号课题的会议上，移动卫生保健这一课题获得了与会代表的强烈支持，大家认为这项服务将为发展中国家带来极大的益处。主要目标是利用移动电话以及通过移动网络连接到附近医院的移动中心/诊所，帮助发展中国家引进并普及移动卫生保健服务。移动电话的数量已经超过固定线路的数量。非洲是第一个出现这种情况的大陆。

此外，2008 年 9 月 9 日，在有关第 2 研究组第 14 号课题的会议上，无线电发展局项目 3 收到了一份提案，其内容是关于开展一项支持“移动电子卫生保健”的举措（见 2/194-C 号文件）。该提案的主要想法是利用各合作伙伴的经验和知识，加快引进电子卫生保健服务。经过讨论，这一提案得到所有与会国家的支持。

本报告强调了通过提供远程医疗诊断和患者治疗管理，移动通信技术在卫生保健领域所发挥的作用。

本报告的编写充分展示了国际电联专家在移动电子医疗领域方面的经验，以及专家们与世界各地众多的合作伙伴成功开展合作的能力。

我希望本报告所提供的信息能够使您受益，包括各类移动卫生保健解决方案以及可作为前车之鉴的经验之谈，从而为那些正在开展此类项目的人提供帮助，满足发展中国家新近出现的电子卫生保健需求。

国际电信联盟电信发展局主任
萨米•阿勒巴舍里•阿勒穆什德先生
2009 年 11 月，日内瓦

序

在报告的开篇，编辑人员希望做出如下说明：

- 本报告无意成为一本介绍移动卫生保健的教科书。已有众多的出版物涉及到了这一话题。甚至仅提供一份有关移动卫生保健的参考书目也是一项难以完成的工作——恐怕出版的时候就已经过时了。
- 本报告的主要目的是提供一些或者已经被成功落实或正在实施之中的有关移动卫生保健解决方案的实用信息，以及可以立即付诸实行的决策，其中某些涉及资金、精神、科学等问题的决策在国际电联的积极帮助下已经成为了现实。
- 报告中所述范例的共同特点是用最少的资金获取最大的收益。所以，这些经验适用于世界各地，特别是资源有限的国家。
- 由于移动卫生保健是电子卫生保健总体规划的制定和实施过程中不可缺少的一部分，本报告还提供了一些电子卫生保健总体规划的范例。

本报告包含三个部分：

1 第一部分集中于背景问题——什么是移动卫生保健，如何利用诊所决策支持软件和医疗信息网络的流量控制系统来推动远程医疗服务、无线接入和连接模式以及电子卫生保健总体规划的结构；

2 第二部分提供了来自各国的一些实用范例。各位作者试图回答诸如“怎样”、“在何地”以及可能情况下的“在何时”这类问题，但还不仅局限于此；

3 第三部分是报告附件。

尽管本报告针对发展中国家的同事，但我们希望它能够引起所有参与移动卫生保健工作的人员的兴趣。我们相信，所有的人，尤其是那些正在准备向本国引进移动卫生保健的人士，都能从本报告提供的信息中受益。它山之石，可以攻玉。本报告可以帮助人们了解在实施移动系统或服务的过程中或之后将会遇到的问题，从而不走或少走弯路。由于篇幅所限（仅 50 页），如需更详尽的资料，请参阅每篇文章结尾部分的参考书目。

编辑人员在此向付出辛勤劳动的各位撰稿人表示诚挚的感谢。

愿各位从阅读中获得乐趣。

鸣谢

国际电联电信发展局希望向在本报告的编写过程中坚持不懈并出色完成工作的远程医疗/电子卫生保健专家组的各位成员表示感谢。

负责编写本报告的专家组成员包括：Leonid Androuchko 教授（ITU-D 第 2 研究组远程医疗组报告人，瑞士日内瓦国际大学教授）、Malina Jordanova 博士（保加利亚科学院日地影响研究所）和 Isao Nakajima 教授（日本东海大学医学研究所）。

此外，世界各地的众多专家也对本报告提供了各种意见和看法，我们在此一并向他们表示感谢。

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移动卫生保健（m-Health、mHealth 或 Mobile Health）– 哪个名称是正确的？

Malina Jordanova，保加利亚科学院日地影响研究院，
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实际上，关于移动卫生保健的 m-Health、mHealth、Mobile Health 等诸术语都是正确的。mHealth 是移动卫生保健的简写形式。移动卫生保健背后的最初概念是为了支持通过广泛应用所有可用的移动技术 — 移动电话、个人数字助理（PDA）、监视设备等来提供的医疗保健服务。最近，对移动市民的医疗保健支持也已成为理解移动卫生保健的一部分。

移动卫生保健的利益巨大，受以下若干因素的推动：

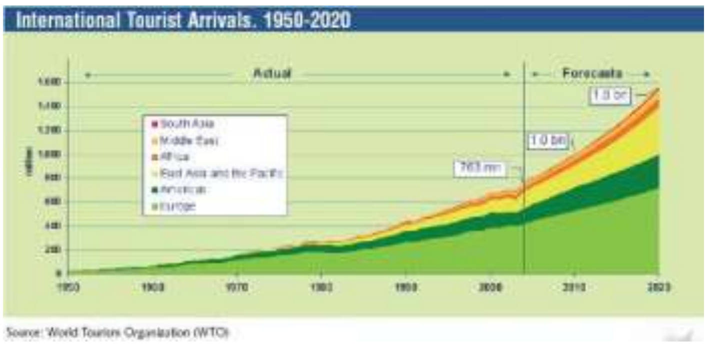
- 廉价的、广泛可用的通信设施以及成本更低的、性能更强的计算机；
- 公众对计算机和通信技术的应用日益认可，信心日益提高；
- 在通信、视频会议等方面有望达成全球标准；
- 紧急需求不允许医疗保健预算大幅增加；
- 在全球化和移动性日益增强的今天，不论其身处何处，都需确保为全体公民提供全天候（每周 7 天、每天 24 小时）、高质量的医疗保健。

让我们澄清最后两点：

1 要求减少、或者至少不允许增加太多的医疗保健预算。这是所有国家的战略目标。如果对 6 年（2000～2005 年）来的医疗保健投资进行分析，可以明显看到，许多国家都被迫持续增加医疗保健投资。WHO（www.who.int）的数据库清楚地显示，在 21 世纪初的前六年里，许多国家的医疗保健支出增幅大于 1%。如果这一趋势继续下去，那么政府将被迫削减其他费用，以保证医疗保健预算的可持续性。

2 所有国家都面临移动性和全球化的问题（如图 1 所示）。概括而言：2007 年，旅行人数达到 8.98 亿；2020 年，这一数字有望增加到 15.6 亿。2007 年的数据还表明，全世界有 3600 万人移居国外，当中有 36%的人生病或受伤，且至少 1%～5%需要医疗支持。

图 1：国际旅游者抵达人数，1950-2020 年



以上事实足以解释移动卫生保健的极端重要性。此外，移动卫生保健是电子卫生保健的一部分，因此，它具有以下前景：

- 在任何时候，任何地方，为所有人提供迅速、及时、高质量、经济上可承受的医疗保健服务；
- 克服医疗保健人员和资金短缺的问题，实现患者护理的最优化；
- 增强预防性的保健；
- 保护人权；
- 教育并增强公民权益等。

毫无疑问，移动通信将根本改善医疗保健服务的潜力是巨大的。时间已经证明了这一点。即使在某些最偏远、资源最匮乏的环境中，移动卫生保健也可以极大提高医疗保健的质量与数量。

移动卫生保健适于收集临床数据以及获取第二种意见或组织临床研讨会，适于医疗人员、患者以及护理人员之间实现快速的双向交流信息，适于医疗保健服务提供者的继续教育等。

移动卫生保健覆盖所有的医疗领域——家庭保健、心脏病学、病理学、外科、急诊、心理健康、康复等。可用的设备在大小上各不相同——从用于监视关键生理参数而开发的便携式手镯和手提箱，到安装在列车与特殊装备的轮船上的移动医院（图 2）。

在本篇短小的报告中，不可能涵盖所有的移动卫生保健方面的问题。除了所包含的论文，在以下各段落中提供了病理学、护理学以及 SMS/MMS 应用领域中的一些其他例子。

图 2：各种各样的设备

a) 以色列—移动监视，Schlisser（2007年）；

b) 《Nomad解决方案》—防水且安全可靠的设备—ECG、Sp0²、肺活量计、血糖测量仪、快速测试；自主性：3小时，传输：GSM/GPRS/3G卫星；重量：3，9 kg Petitet（2008年）；

c) 广泛配备于移动手术室，厄瓜多尔，Rodas（2006年）；

d) 阿根廷—用于信息交换的、安全可靠的移动电话服务，SIM卡置于调制解调器的Micro-SIM型卡固定架内，Escobar（2009年）。

移动病理学

移动病理学实验室是根据 TF 设计和 LTS 咨询公司签署的、来自南非军备局（Armscor）的一份合同而在南非创建的。实验室大小为 6m × 2，4m × 2，4m，它可提供：

- 化学病理学—电解、肝功能、肾功能、血液气体分析、心脏功能……；
- 微生物学和显微镜检查法（包括搜索大便中的虫卵和寄生虫）、血液培养和敏感度检查、尿与大便检查、脑脊髓液研究、细菌样本的普通培育与孵化；

- 血液病学；
- 皮肤病学—皮毛检查和提取活组织检查；
- 怀孕、肝炎和 HIV 的快速测试等。

所有的实验室设备都将提供数字电子输出的结果和图像，并将之馈送给服务器计算机。也可以使用卫星连接线路。因此，数据和图像可以存储并转发至位于偏远处的病理学者手中。条形码和扫描仪用于保证数据和样本的安全性（Molefi，2004 年）。

神经外科

通过移动设备进行的神经外科研究和手术（如图 3 所示）是最近才出现的新兴事务。但经过印度神经外科学会前任主席以及印度阿波罗远程医疗网络基金会现任主席 K.Ganapathy 博士、教授的不懈努力，它已成为现实（Ganapathy，2007a）。除了包括假性发作、非自主运动、帕金森病、肌肉病变等临床检查在内的远程会诊，已经有许多严重的颅脑损伤患者由本地的普通外科医生来负责治疗和管理，包括急性硬膜外血肿的清除、颅骨复合性凹陷性碎骨的切除等，信心的增强，使在线的神经外科视频远程会诊也变得可能了。在移动卫生保健技术的帮助下，在水平高超的专家的监督下，家庭医师也能够为诊断为脑结核瘤和脑囊虫病的患者实施手术了（Ganapathy，2007 年）。这些远程会诊为当地的医学专业人士和家庭医生提供了极大的帮助。远程会诊还在跟踪观察已治愈患者方面极为有用。

图 3：任何地点、任何时间的神经外科

来源：Ganapathy（2007 年）。

SMS 与 MMS

移动电话是移动卫生保健中用途最广的设备之一。

除了专家会诊、会议约定与身体检查、会诊情况与信息的交换、疫苗接种报警系统等之外，应用短信服务（SMS）来管理慢性病也值得一提。这一新兴领域特别有助于精神病学、神经病学和心理学方面的医疗保健。大多数心理和行为上的障碍，都与达到一定康复状态后极大的复发风险有关。不幸的是，一旦结束住院治疗，大多数患者将从不寻求出院后的帮助。GSM 和互联网提供了简易的和用户友好的方法，可以帮助这类患者回到正常生活。

在德国斯图加特的精神疗法研究中心，医学专家基于 SMS，为神经性暴食症患者的后续治疗开发了一种有效策略。干预包括每周从患者那里接收关于其暴食症症状的信息以及发送对应的每周反馈意见，这种反馈意见综合了预先安排好的信息以及专门针对某个患者的特定信息。该干预策略实施的结果表明，它在技术上是可行的，并得到了患者的广泛欢迎，有助于神经性暴食症患者在结束住院治疗后重新适应正常生活（Bauer 等，2004 年）。

另一个成功案例是南非 2002 年实施的“On Cue（提示）”项目，它向肺结核病人发送 SMS，提醒他们遵守药物疗程。在选定的时间段内，医护人员向患者每隔半小时发送一次 SMS，以提醒患者服药。到 2003 年 1 月，开普敦市仅为这种 SMS 提醒支付了 16 美元/患者/年的费用。在这一试验中，138 位患者中，只有 1 位没有遵守药物疗程（遵守率为 99.3%）！这是值得一试的事情！

也可以使用 MMS。值得关注的案例是瑞典的案例，该国在皮肤病学领域专门设立了一个 24 小时不间断的匿名和免费会诊项目。这一项目开始于 2008 年，使那些希望获得皮肤病学家建议的患者，通过向一个固定号码发送皮肤病变照片和简要文字说明，就可以获得建议。结果显示，在大约 77%的案例中，在请求后的 24 小时内，有可能预约到远程治疗（Börve 与 Molina-Martinez，2009 年）。

对于那些对这一主题尤其感兴趣的人，联合国基金会和 Vodafone 基金的《移动卫生保健的发展：在发展中国家的医疗保健中应用移动技术的机遇》报告，也是一种推荐的资源。该报告最宝贵的部分之一是对移动卫生保健项目的简要概述。对此感兴趣的人们不仅能够发现明智的建议，而且能够找到合同的细节。我们没有必要一次又一次地从头做起，就让我们使用前人的经验吧！

移动护理或远程护理

最后，让我们介绍移动卫生保健的另一个方面—远程护理！这是移动卫生保健在专业护理实践中的应用。在过去 10 年间，远程护理技术得以发展（Schlachta-Fairchild，2008 年），并且影响日益扩大，它拥有各种各样类型的、用于家庭/个人健康监视的移动设备。美国就是一个很好的例子。尽管存在每次就诊都能得到大多数的医疗保健服务这一事实，因此人们对远程护理并不十分欢迎，但在过去不到 5 年的时间里，美国的远程护理数量还是增长了 600%。国际上的远程护理事业有望发展得更加迅速，尤其是在那些社会化医疗为远程护理提供了财政支持的国家中。不过，由于有以最低成本提供最佳护理的迫切需求，因此在未来几年中，远程护理应用的增长将会更加显著。

2004-2005 年间开展的“国际远程护理作用调查”，为远程护理提供了更多的信息。其目标是确定发展远程护理的领域、远程护理是否被人们所接受、是否有效以及远程护理工作是否满足要求。从 39 个国家中收集的调查结果表明，典型的远程护理护士是在远程护理行业中全职工作的白人女性，已婚、已育。远程护理护士承受的角色压力、角色模糊和角色冲突小于平均水平，并与在医院工作的其他护士一样，拥有相同的工作满意度。远程护理护士对工作感到满意的最重要因素在于自主性和交互性。远程护理护士对这种体力要求不高的职业感到满意，并确信能够管理和提供更好的患者教育、使患者不用住院、提供更好的护理效果、减少住院治疗、节省时间等。59%的远程护理护士表示，相比过去的“普通”护理工作，她们更满意现在的远程护理工作（Schlachta-Fairchild 等，2008 年；Gundim，Padilha，2008 年；Castelli 等，2008 年）。

移动卫生保健不再只是一种可选方案。这一服务越来越先进，并且越来越受到市民和医学专业人员的认可。事实已经证明，远程的护理服务可以增强自我护理、改变与医疗保健有关的行为，长期坚持下去，可以改善患者的护理效果。

移动卫生保健已成为未来必将面临的、巨大的挑战，但它需要在所有可能的层面上开展合作与进行协调，它需要实现网络化、做好规划、随时准备从其它方面汲取经验，而无需从零做起。主要的挑战是确保可用的选择方案能够最优化地得到应用，并以一种协调良好的方式确保得到期望的结果，以及确保各种资源确实用于基本的需求。

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临床决策支持软件

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引言

在发展中国家，大多数人没有获得基本的医疗保健。多年来，国际社会一直致力于缩小这一鸿沟，但未能取得一致的、可重复的成功。尽管已经获得一些进展，但并没有获得可以对初级护理服务的提供产生重大影响的任何系统。医学在迅猛发展，已使医疗保健服务的提供变得更加复杂、更加昂贵，有时候，使大部分人变得更加无法获得医疗保健服务。不过，信息通信技术的迅速发展以及日益普及，为消除这一鸿沟带来了新的机遇。信息通信技术改善了医疗保健服务的提供状况，使之更加普及，尽管它对医疗保健的影响尚未在所有层面上感受到。

医学的主要目的是减轻人类的痛苦；医疗技术的迅猛发展并未满足这些期望。更糟的是，患者与医生之间的距离逐渐拉大、二者之间缺少交流，是其中一种不愿看到的结果。信息技术可能是有助于消除这一鸿沟的若干新工具之一。医疗保健行业可以向其他部门学习经验，例如面向草根阶层的小额金融以及各种其他业务。

过去十年间，惠及发展中国家最贫穷地区的移动通信急剧增长。移动电话的使用日益方便，基于移动平台的互联网接入日益扩大，使得数字鸿沟迅速得以缩小。利用这一趋势来缩小在基本医疗保健服务中的巨大鸿沟，看起来是一种合理的选择。信息技术以及相关的技术可以成为引领医疗保健行业发生变革的催化剂，从而将基本的医疗保健服务带给之前无法抵达的地区。

在欢迎这些新技术时保持谨慎态度，并强调构建由医疗保健、信息技术和管理专家组成的多学科团队，是明智的做法，以便能够在信息技术平台上开发出成本低廉、用户友好的标准医疗保健服务。

方法

eClinician CDSS（临床决策支持系统）是 9 年前构想的一个雄心勃勃计划的结果。多年来，它由医生和软件开发人员共同研发，他们成功、系统地整合了来自标准医疗书籍和文献中的信息。医疗工作团队由 24 名医学专家组成，当中的许多人是学术界人士，包括来自全球医学院和医院的知名教授。除了这些专家之外，该团队还有一些普通医生，由他们来保证该软件对普通医生而言是用户友好的。对医疗信息进行了简化，以便于护理部门使用，并结合进了专业医疗机构建议的最新指导原则。例如，HIV 与 AIDS 信息作为单独的模块列出，并结合进了世界卫生组织（WHO）的指导原则，它包括大量的文献评论和治疗指导原则。国际疾病分类（ICD 10）章程也被融入其中，并不断得到更新，以避免术语的不一致，这有助于数据挖掘以及监视不同医疗保健提供部门的标准。

软件现已经过若干年的优化，可看作是一种创新工具，从医疗保健角度来看，可以提高医疗保健和决策的质量。该程序特意为医疗保健工作者而设计，只需很少的、甚至不需要专门的计算机知识就可以使用，程序足够灵活，足以满足不同层次的从业人员的需求，从普通的医疗保健从业人员到专家。

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eClinician 临床决策支持系统拥有一个包含 4 500 多种疾病、1 300 多个实验室调查结果的数据银行，该数据银行包含了标准值、ICD-10 交叉参考、药物交互作用、HIV 与 AIDS 治疗指导原则、临床检查方法以及关于各种主题的注释，如接种免疫、维生素缺乏症等。

eClinician 的独特价值在于差别诊断模块，它是通过利用数千种征兆和症候而开发出来的一个逻辑系统。该系统能够从患者的征兆和症候中产生所有可能的差别诊断，包括在临床诊断中常见的和罕见的各种可能性。该系统有助于医生避免忽视罕见条件，并提供在复杂案例中的决策支持。

eClinician 主要针对发展中国家农村、城乡结合部甚至城市地区提供临床服务的医生而特别设计。eClinician 是医疗从业人员的一种辅助工具，它易于使用，为实际工作增加了价值，并可从医疗保健角度，立即访问最相关的医疗知识。

我们曾经做过一个试验性的研究，以评估该软件的准确性和效用。利用方便的采样方法，选择了四位在医院和临床环境中工作的医生，两位是普通医生，一位是儿科医师，还有一位是整形外科医生。

研究采用了四十个临床病例——选择这些医生在实际临床治疗过程中遇到的病例——每位医生选 10 个病例。这些患者出现的征兆和症候被输入到软件中，记录差别诊断产生的列表，并与调查后医生所做的实际的最终诊断结果进行比较。

在所有病例（100％）中，医生给出的临床诊断结果都出现在了由 eClinician CDSS 产生的差别诊断列表中。在 35 个病例中，医生做出的最终诊断就是差别诊断列表中的第一个诊断结果。对 3 个病例，最终诊断结果与列表中的第二个诊断结果匹配，对剩下的两个病例，则与 eClinician 产生的差别诊断列表中的第三个诊断结果相匹配（如表 1 和图 1 所示）。

表 1：eClinician 在产生差别诊断中的准确性

		由 eClinician 产生的差别诊断	
	在 eClinician 产生的诊断列表中的最终诊断	实际诊断位于列表第一位的情况	实际诊断位于差别诊断列表第二位或第三位的情况
数量	40	35	5
%	100%	88%	12%

讨论

eClinicianCDSS 软件相当准确、用户友好，并具备提高临床医疗保健服务效率、提高医疗保健质量的巨大潜力。该程序在灵活的计算平台上开发，可移植至移动技术中。由于移动通信技术正变得越来越普及，因此 eClinician 系统可以变得为世界各地的医生和医疗保健从业人员所用。

此外，eClinician 可以与任何电子医疗记录实现链接，从而整合到正常的患者流程中—病史采集、重要征兆、检查和实验室测试—输入的数据还可以作为程序的输入，基于这些数据，可以做出差别诊断。这将增大做出更加准确诊断的可能性。同样重要的是，该软件能够实现对相关医疗文献的即时访问（只需一、两次的点击即可），如果不使用该软件，通常需要多用 15～20 分钟，并且需要中断工作流程，这可能引起患者的不满。

其他潜在的益处包括普通从业人员有可能诊断和更好地管理更加严重的临床情况，当遇到这种情况时，通常他们会参考专家的意见，或者出现彻底的诊断失误。更好的医疗保健效果以及医疗保健费用的降低，反过来将使患者受益。

使用 eClinician CDSS，将有利于更广泛的临床判断和更迅速的诊断；通过准确和及时的诊断而节约费用；避免不必要的实验室测试；可以持续不断地对医生进行培训，使他们的知识不断得到更新；利用药物信息，有助于避免用药错误；在数秒钟内提供药物交互作用。

结论

现代医疗保健的情形是技术、医生和患者的独特结合。在临床决策支持中使用医疗软件技术是不够的。不过，包含了移动通信和高速互联网连接的最新技术发展，带来了黄金机遇。利用适当的医疗软件将这些技术恰当地整合起来，可以对全球的医疗保健服务提供模式产生革命性的变革。最终的受益者将是发展中国家的底层和农村人口。

利用医疗信息网络通信控制系统
推动远程医疗服务

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引言

远程医疗服务是利用信息通信技术（ICT）提供的一种医疗保健和医疗服务形式。这种形式的服务有望缩小在任何时候、任何地点都能获得医疗服务的区域差别。在 2006 年 1 月日本政府宣布的《新信息技术改革战略》中，推动远程医疗服务是一个重要的政治议题。

互联网有助于推动远程医疗服务，但在服务质量（QoS）和安全性方面存在顾虑。因此，为提高服务质量，NICT 研究和开发了一个用于控制医疗信息网络之网络通信的系统。

背景

我们的研究基地位于北海道旭川市，这里是整个日本地理面积最大、人口密度最低的地方，60%甚至更多的人口聚居在 10 万人口的城市中。一半的医生居住在邻近的札幌市。在北海道的农村或偏远地区，医生的短缺已成为一个严重的问题。农村地区的患者必须长途跋涉到大城市的医院，才能获得专业的医疗服务。结果是，患者需要花费大量的时间和金钱，在农村或偏远地区与大城市之间来回奔波。1994 年，北海道的一家大型医院—旭川医学院附属医院，开始采用远程医疗来弥补医生的缺乏，并减少患者在农村或偏远地区与大城市之间来回奔波所花的时间和金钱。1999 年 7 月，日本成立了第一家远程医疗服务中心，自那以后，该中心每天都为放射科、眼科和病理科等专科提供远程医疗服务。在 2005 财政年度，远程医疗服务的使用次数约为 400 次。

远程医疗服务预测

根据 2005 财政年度的医疗服务记录，在旭川医学院附属医院的门诊病人中，约有 10 万人（30%）来自旭川市以外的北海道其他地区。因此，如果在整个北海道地区引入医疗信息网络，那么我们预计，该远程医疗服务中心的使用频度将会是 2005 年的 30 倍。

远程医疗可以提供高级和有效的医疗服务，例如用于：

- 在手术之前或手术之后，利用高质量的视频实时传输（40～60 Mbit/s）而召开的远程会议（1～2 Mbit/s），进行远程诊断和会诊；
- 在手术之前阅读电子临床记录，例如在农村或偏远医院获取的组织样本显微照片（1～5 Mbit/s）；
- 远程病理学（病理科的远程诊断）；
- 传输用于诊断的组织样本显微照片（1～5 Mbit/s）；
- 接收使用组织样本显微照片得出的诊断结果（1～5 Mbit/s）；
- 使用远程会议解释诊断结果（1～2 Mbit/s）；
- 远程放射学（放射科的远程诊断）；
- 传输 CT/MRI X 线断层照片等，用于诊断成像（5～10 Mbit/s）；
- 接收含有 CT/MRI X 线断层照片的诊断结果等；

- 使用远程会议解释诊断结果（1～2 Mbit/s）；
- 其他医院的电子临床记录；
- 阅读在农村或偏远地区其他医院的、关于患者最初就诊情况的电子临床记录（1～5 Mbit/s）；
- 在大医院中构建医疗影像数据库；
- 为病理学和放射学而保存带有诊断结果的静态影像（1～10 Mbit/s）；
- 记录和保存高质量的手术视频资料（40～60 Mbit/s）；
- 出于培训和教育目的，向农村或偏远地区的医生分发各种培训内容。

项目定义

旭川医学院附属医院的远程医疗服务中心一直在用 ISDN 或尽力而为服务（IP 网络）来连接偏远的医院。遗憾的是，电信运营商提供的这些服务带宽有限，或者不能保证传输质量。因此，在北海道引入医疗信息网络将极大地改进远程医疗状况。

自 2005 年 6 月以来，国家信息通信技术协会（NICT）北海道研究中心和旭川医学院附属医院共同研究了如何根据远程医疗服务的要求来控制医疗信息网络的通信问题。

IP 网络通常基于尽力而为服务（best-effort），好比互联网。不过，远程医疗服务要求具备一定等级的通信质量，以便高效运行，并能够在紧急情况下优先处理医疗信息。这将类似于当应急车辆靠近时，普通车辆如何退至一边以便为其让开道路使之通过。

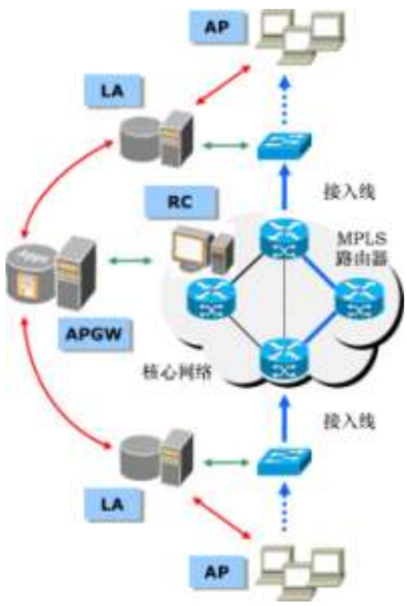
为了满足这些要求，我们研究和开发了一个随需所应的医疗信息网络系统（平台），它可以通过提高用户请求在多协议标签交换（MPLS）网络上的优先等级来对通信实施控制。

随需所应的医疗信息网络系统能够根据应用和用户请求来灵活地控制网络通信，并保证数据的顺利传输，即使在拥塞的通信网络中或者在网络资源有限的条件下。

系统描述

图 1 显示了系统的总体结构。为了控制网络带宽，在用户接入线上进行的数据传输必须适应在连接于 MPLS 路由器的核心网络上进行的数据传输。本地管理员（LA）负责管理用户的应用程序和接入线，它们存在于用户与核心网络之间，是一种本地资源。应用网关（APGW）负责控制来自每位本地管理员（LA）的请求，并将这些请求通过路由器控制器（RC）转发给 MPLS 路由器，以保证核心网络资源的安全可靠。

图 1：随需所应的医疗保健信息网络系统



为了对用户请求做出响应，LA 和 APGW 确定优先的应用，并向网络控制传送结果。在那个时候，他们根据网络运行和用户使用层次分析法（AHP）（参见表 1）确定的优先级，考虑采用某种优先级策略。用户根据有关紧急等级（紧急或普通，如图 2 所示）和必要等级（V 至 I 级，如表 3 所示）的指导原则来确定优先级。这样，网络是受控的，高优先级的应用因此能够获得优先保障的带宽以及适当分配的路径。

表 1：用于计算优先级的参数权重

紧急		必要		应用类型		传输类型		医疗保健部门	
40		**30**		**15**		**10**		**5**	
紧急	65	V	45	临床记录	26	流媒体	68	眼科	27
普通	35	IV	34	静态图像	14	文件传输	32	内科	42
		III	12	视频	41			病理科	7
		II	7	远程会诊	19			放射科	24
		I	2						

- □ 通过基于网络运营情况的优先级策略来对各个参数进行加权。
- □ 通过层次分析法(AHP)来对各个参数的每个项进行加权。
- □ 通过结合参数和项来为各种案例计算优先级：

（例如） [紧急] [必要 V] [视频] [流媒体] [内科]

(40×65) ＋ (30×45) ＋ (15×41) ＋ (10×68) ＋ (5×42) ＝5455

表 2：紧急等级指导原则

等级	定义	示例
紧急	医疗保健信息是立即需要的	延误时间可能严重损害机体功能并危及生命的各种情况
普通	医疗保健信息不是立即需要的	普通门诊病人检查的电子临床记录 预先计划的远程诊断

表 3：必要等级指导原则

等级	定义	示例
V	医疗信息传输对医疗实践是不可缺少的，立即需要进行数据传输。	针对由农村或偏远地区医生进行的治疗与手术，来自专家的远程指导。 在手术期间，有关远程病理学的请求。
IV	医疗信息传输对医疗实践是必不可少的，数据传输必须在指定的时间内完成。	有关远程放射学和远程病理学的、远程诊断请求。
III	可以进行医疗实践，信息传输将是有帮助的。	在手术期间，来自专家的远程建议。 偏远地区医院也可以拥有一位专家。
II	可以进行诊断与治疗，期望进行信息传输。	在最初的门诊检查中通常所需的背景信息（在农村或偏远地区医院中所做最初检查的病历和说明）。
I	针对不包括诊断与治疗的各种其他用途。	出于研究目的而获取数据。 分发出于教育目的而录制的手术视频。

结论

基于用户请求的网络通信控制将是发展医疗信息网络以推动远程医疗服务的一个重要因素。我们提议的随需所应的医疗信息网络系统，将确保更好地获得高质量的远程医疗服务，即使在全世界的农村或偏远地区中网络资源有限的条件下，亦是如此。

发展中国家社区医疗保健工作者的无线接入与连接：模式

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引言

发展中国家的医疗保健体系面临艰巨任务，肩负着与其人民面临的慢性病和传染病作斗争的双重重担。财力的不足[1]加上大量的人才流失所导致的大量高中级医疗保健从业人员的流出[2]，使这一局面进一步恶化。联合国确立的千年发展目标（MDG），可以作为解决发展中国家所面临的这些疾病负担的一个推动力。千年发展目标（MDG）是联合国于 2000 年 9 月通过的八大目标[3]。它包括呼吁各国采取更为合作的举措，来共同应对贫困、文盲、饥饿、缺乏教育、性别不平等、母婴死亡率、疾病以及环境恶化等问题。

在大多数发展中国家中，与千年发展目标（MDG）相关的疾病，主要涉及的是占大部分发病率和死亡率的疾病。不过，人们担心的是缺乏到 2015 年指定日期之前实现预定目标所需的指导与资源[1]。千年发展目标（MDG）的一个主要贡献是，帮助世界各国将这些重大的医疗保健负担问题纳入全球发展议程和言论[4]。通过批准《关于初级医疗保健（PHC）的阿拉木图宣言》[5]中的原则，可以快速而有效地实现与医疗保健有关的千年发展目标。对当前所讨论的问题而言，尤其重要的是，社区参与提供基本医疗保健服务的原则。

社区参与原则为来自社区内的医疗保健工作者参与提供初级医疗保健服务提供了可能。缺乏适当的、能解决公共医疗保健问题的人力资源，已被认定是许多发展中国家中的一个主要障碍[2]。

最近，人们呼吁应将战略重点放在发展替代医疗保健工作人员上，以解决在发展中国家中如何提供医疗保健服务的问题[6]。在许多发展中国家中，社区医疗保健工作者（CBHW）已成为初级医疗保健的长期提供者[7]，因此认为今后可长期坚持下去。2006 年《世界医疗保健报告》[8]着重强调了解决全球医疗保健工作者缺乏的问题，但特别强调了发展中国家和地区的问题。强调了 CBHW 在这些国家和地区提供基本医疗服务的关键作用。在全球范围内，CBHW 已占所有医疗保健工作者的三分之一左右，这一事实更加突显了其在提供医疗保健服务方面的重要性[9]。不过，这一比率在发展中国家中可能会更高，有证据表明，在这些国家，免疫覆盖范围的扩大应归功于 CBHW 的使用。

本报告中一条值得注意的建议是，支持 CBHW 在开展医疗保健活动时采用移动/无线信息通信技术[（m）ITT] [8]。因此，支持 CBHW 使用 mITT 应认为是今后应首先考虑的一个问题。

使用信息通信技术（ITT）作为“使能器”，已经融入千年发展目标（MDG）的议事日程中[3]。作为对此的响应，世界卫生组织（WHO）还提议使用电子卫生保健（将信息通信技术应用在医疗保健中），以便提高医疗保健服务的效能，尤其是在发展中国家中[10]。此外，国际电联还继续为使用“宽带”mITT 来缩小发达国家与发展中国家之间以及发展中国家内部之间的数字鸿沟创造可能[11]。实现时间缩短了、维护费用降低了以及无线网络对有线连接网络的高度适应性，是国际电联提出这一建议的基本依据。在发展中国家中，相对较低的成本以及相比固定计算机而言移动用户设备的经济可承受性[12]，也进一步强化了这一基本依据。因此，本文提议发展中国家使用 mITT 来支持 CBHW 的医疗保健活动。本文中的 mITT 包括无线连接设备和移动接入设备。

电子卫生保健在医疗保健部门的应用涉及以电子方式传输、储存和检索数字数据，为本地和远程的医疗保健服务提供支持[10]。因此，mITT 只是电子卫生保健应用的平台或支撑[13]。主要的差别在于它利用无线技术替代了有线技术，或者说是利用移动技术替代了固定技术，它是可升级的而不是固定不变的。

由于互联网为使用在线服务和信息提供了一个全球化的和分布式的平台，因此，在许多发展中国家，使用它来缩小数字鸿沟已被证明具有积极的影响。这些影响的例子包括，能够在教育、卫生和农业等部门推动试验活动的展开。诸如万维网服务、电子邮件和即时通短信（IM）之类的互联网应用，可以通过 mITT 的连通性来提供医疗保健信息与服务。已经试验验证了如何利用这些应用来在发展中国家提供电子卫生保健服务。例如，RAFT 程序，这是一个来自马里的、开放源码的、万维网远程医疗网络[14]。通过局域网，以及依托陆地和卫星无线连接而几乎遍布整个大陆的分布式网络，该网络可为医疗保健人员提供协作式的电子学习以及远程会诊服务。

下面将进一步阐述通过具有 mITT 功能的电子卫生保健网络，来为发展中国家的 CBHW 提供连接性的基本原理。

社区医疗保健工作者

CBHW 由在社区内挑选、培训和工作的各种不同的医疗保健工作者组成。他们应对自己所在的社区负责，并接受医疗保健系统的培训和指导，但可能不属于医疗保健系统，且其通常比专业医疗保健工作者接受的教育要短一些[7]。在非洲的医疗保健系统范畴中，他们被认为是广泛的低级医疗保健工作者群体，居住在农村、城市和城乡结合部等环境中[7]。他们执行医疗保健机构的任务，例如居家形式的患者护理、改善环境医疗保健状况、支持大规模免疫等的医疗保健计划、对肺炎、TB、HIV/AIDS、疟疾、母婴疾病等病症进行诊断与/或治疗。今后，他们的活动将获得机构支持系统的支持，例如电子卫生保健记录（EHR）、决策支持系统（DSS）、远程会诊等。除了提供基本的医疗保健服务，他们还是其所属社区的社会改革促进者。

今后，利用 mITT 基础设施来支持 CBHW，使他们能够开展医疗保健和社会活动，将对他们的工作效果产生积极的影响。例如，对一位 HIV/AIDS 患者进行家访时，如果 CBHW 能够使用个人数字助理（PDA）访问患者的医疗记录，那么可以有效跟踪患者是否遵守药物治疗方案，如 ART 药物，并且可以监视这些患者的健康状况和治疗的进展情况。这将有可能使患者获得更好的治疗效果，并最终从整体上提高医疗保健系统的效能。在本节中介绍的 CBHW，对发展中国家而言，是一支非常重要的、向公民提供基本医疗保健服务的力量。因此，在接下来的各节中，将继续讨论如何使用 mITT 来实现电子卫生保健的目标。长期以来，国际电联致力于在发展中国家将 mITT 运用于有助于推动这些国家发展的目的中去，如医疗保健服务等[11]。不过，就目前的情况来看，它们在大多数发展中国家中的应用（大多数是 GSM/GPRS、WiFi)，仅限于语音通信，而只有少部分的数据传输，尽管在这些地区宽带 mITT 日益兴起和可用，如 WiMAX 和 3G 等。在医疗保健系统中进行通信和数据传输通常要求具备宽带 ITT，它们是处理密集信息的基础。此外，为使医疗保健工作者能够有效开展患者护理，并提高医疗保健系统的性能，需要向医疗保健工作者提供对医疗保健信息系统（HIS）的接入与连接，这将进一步强化这一理念。

发展中国家 CBHW 的 mITT 接入与连接模式

可以通过不同类型的固定或移动接入点，向在社区内工作的 CBHW 提供互联网接入。这些接入点可以用来提供语音服务，也可以用来提供数据传输服务，要么以储存并转发的模式提供，要么以实时传输的模式提供。

对于固定的无线接入，建议的模式包括使用通过宽带 mITT 连接的公共或私营电话亭（PCO）[15]、孟加拉乡村银行农村付费电话（VPP）[16]、社区电信中心、社区信息亭的 DakNet 模式[17]等。例如，可以通过基于 GSM 的、公共或私营的共享接入点，来提供 SMS 和 MMS 之类的低成本、储存并转发数据的访问平台，以及经由语音邮件的语音接入。这些可以通过具备 GSM 功能的

“共享的数据接入”概念来提供，它是一个向来自单一接入点的多个用户提供互联网接入的系统。对语音通信，可以采用“共享的语音接入”方案，即部署应用便携式 GSM 无线电话亭，它配备有太阳能充电附件，这是对商业公共电话亭的一种模仿[18]。这两种“共享的接入模式”也都可以部署并供一起工作于医疗保健站或医疗保健中心的 CBHW 团队使用。

通过孟加拉乡村银行（VPP）模式或者社区信息中心（CIC）来部署和应用这些理念，可以为发展中国家的农村和城市地区的 CBHW 提供适当的连接手段。这样，就可以通过位于 CIC 中的、共享的桌上型个人计算机来访问电子邮件和享用互联网服务，例如在乌干达的 Nakaseke MTC 模式中的情形[19]。此外，针对 CBHW 的实时语音通信，可以通过“共享的语音接入”模式或者通过 CIC 中的 VOIP 来提供。基于移动－固定或半移动概念，可以为 CBHW 配备移动设备，如移动电话、个人数字助理（PDA）和无线智能卡或 USB 储存棒。这些可以异步地连接于无线接入点（WAP）上，或者要么像 UHIN 、乌干达概念[20]一样置于 CAP 内，要么像印度的 DakNet 模式[17]一样，通过红外、蓝牙和 WiFi，有线或无线实现与台式个人计算机的连接。

实时的多媒体和各种近实时的应用，如通过互联网的视频会议和即时通短信（IM），也可以通过 CIC 内无线连接的个人计算机来提供，用于远程会诊或者召开交互式电子学习专题研讨会，如在 iPath 项目中所演示的那样[14]。如 Mindset Health 项目中一样[21]，也可以采用通过社区数字屏幕的公共接入点。还可以使用来自微软公司的、提议的 FonePlus 概念。这旨在使移动电话能够通过电视来提供互联网接入，而电视目前在大多数发展中国家已得到广泛应用。

对于 CBHW，可以利用具有 WiFi 功能的移动设备来提供完全的移动社区互联网接入，反过来，这些移动设备可以通过脚踏车或公共汽车上的移动接入点（MAP），实时地[22]或以特殊方式，直接与社区的 WAP 相连，如同印度的 DakNet 项目[17]。这样，这些移动设备可以通过分组接入的无线网络来提供数据和语音访问。使用低成本的移动最终用户设备，例如“每个小孩一台笔记本电脑项目（OLPC）”及其相仿者，如 Intel Classmate 等，可以使这种方法在发展中国家做到经济上和技术上都可行。例如，社区免疫计划中的一个 CBHW 小组，可以使用带有 OLPC 设备的“共享的接入数据”模式，来录入或访问现场患者的疫苗接种信息。这些都是建议的、可以利用发展中国家现有 CAP 来支持 CBHW 医疗保健活动的方法。不过，一种将支持 CBHW 活动特性的、完全移动的无线连接和接入方法，可以通过 GPRS 和 WiFi 网络而实现的。

结论

本文介绍了 CBHW 对在发展中国家提供医疗保健服务的重要性。

通过 mITT 为 CBHW 提供接入和连接服务，有望推动实现世界卫生组织（WHO）关于人力资源建设的目标。通过这些模式访问各种有组织的知识系统，如 DSS、CME、EHR，可以更好地、更有效地为患者提供医疗保健服务。不过，成功采纳并推广应用这些技术，需要从协同的角度来看待组织、技术、文化和最终用户方面的问题。组织方面的问题，如 CBHW 工作模式的改变、与 CIC 的接入协商，或者是与私营提供商的费用协议等，必须予以解决。为适应这些变化，也需要考虑对医疗保健体系进行重组。一个主要的、组织外的问题是，如何以低成本使 CBHW 能在经济上承受得起 mITT。技术方面的问题，如为便携的和无缝的连接以及在社区中的接入而设计移动设备、为求优化而设计和配置无线网络等，也都很重要。当前，我们的研究工作旨在探讨如何通过对发展中国家医疗保健系统中 CBHW 对 mITT 的使用情况进行建议的评估，来使这些问题更好地被人们所理解。

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如何加快引进电子卫生服务

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引言

题为“通力合作，增进健康”的 2006 年世界卫生报告指出，据估计，全世界共缺少近 430 万名医生、助产士、护士和辅助工人。今天，这一情况没有太大的变化。最贫穷的国家境况最差，这在非洲地区表现最为明显，该地区的疾病负担占全世界的 24%，但医疗工作人员仅占全世界的 3%，所支配的医疗支出不到全世界的 1%。医疗工作人员的极度缺乏源于医疗服务及人员培训领域长期的投资不足。以印度为例，根据印度医疗学会最近开展的一项调查，在城市中心从业的合格出诊医生仅占 75%，在半城市化地区为 23%，在多数人口生活的农村则仅占 2%。

今天，毫无疑问，电子卫生服务对于世界各国极为有益，对于发展中国家则益处更大。对于很多医疗专家来说，电子卫生服务非常重要。在现代信息通信技术的帮助下，发展中国家的人民能够更好地获得医疗服务，同样，服务质量也会得到改善。

最近，世界卫生组织汇集了各成员国卫生部关于电子卫生的意见，并将这些意见发表在题为《建立电子卫生的基础》的世界卫生组织《电子卫生瞭望》的一份报告中[1]。在 192 个世界卫生组织成员国中，将近 60%为这些调查提供了信息。对电子卫生总的看法是积极的。另一方面，迄今为止，在发展中国家实施电子卫生服务的进展仍然非常缓慢。某些原因导致了这种情况，因此，了解哪些方面存在着障碍是很有必要的。作为开端，我们希望仅研究一个重要的方面——发展中国家的医务工作人员对电子卫生的认识。

发展中国家的看法

本研究选择了三个国家——乌干达、巴基斯坦和不丹。我们制定并分发了问卷调查表。考虑到一些医务工作人员可能不太了解电子卫生，问卷调查表的开始部分对这一新技术做了简要介绍。为了收集信息，采用了访谈法。

在问卷调查表中，提出了下述问题：

1 您在本次调查前听说过电子卫生吗？

2 您是在哪里听到有关电子卫生的介绍的？

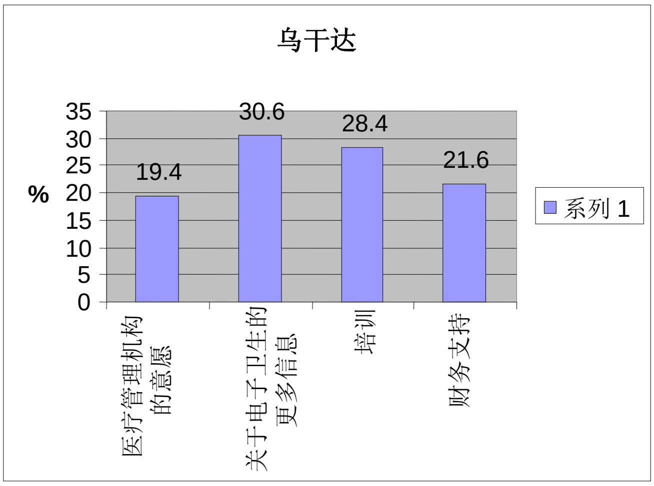
3 您对于在发展中国家推广电子卫生服务有什么看法？

4 为了在发展中国家的医疗服务中引进电子卫生服务，需要做哪些事情？

乌干达

乌干达远程医疗协会主席 Catherine Omaswa 博士负责管理分发问卷调查表和组织访谈。问卷调查表分发给坎帕拉各大医院的医务工作人员。共有 58 人接受了访谈，其中包括 37 名医生、13 名护士和 8 名医务管理人员。73%的受访者对第一个问题做了肯定的回答，这是因为国际电信联盟于 2000 年在乌干达实施了首个远程医疗示范项目。坎帕拉的两个大型国营医院通过远程医疗链路实现了互连，用于传输 X 光图像和医疗诊断。该项目使乌干达的医务工作人员更深入地了解了信息技术在卫生保健领域的潜在益处。因此，在 58 名受访者中，有 56 名受访者（占 96.6%）赞成向发展中国家推广电子卫生服务。没有人表示反对电子卫生。有两人未提供答复。对第四个问题的答复见下图 1。

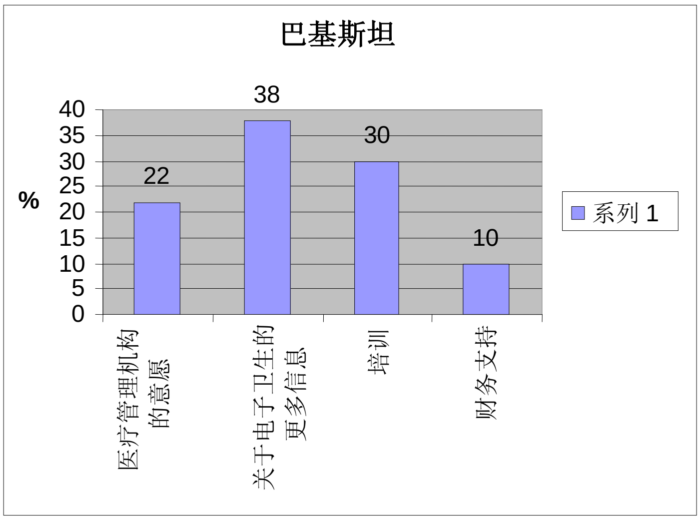
图 1：



巴基斯坦

巴基斯坦拥有 1.5 亿人口，在全世界人口最多的国家中排名第六。该国人口的 65%生活在农村地区。在巴基斯坦开展的调查是在远程医疗协会主席 Asif Zafar Malik 教授的监督下进行的。在巴基斯坦两大主要城市——拉瓦尔品第和伊斯兰堡的医务工作人员中分发了问卷调查表，总共收回了 110 份答复。在该调查中，61%的受访者表示对电子卫生有所了解。关于第三个问题的回答结果如下：86.5%支持引进电子卫生服务，6.3%表示反对，7.2%未做答复。下图 2 提供了对最后一个问题的答复——为了在发展中国家的医疗服务中引进电子卫生服务，需要做哪些事情？

图 2：

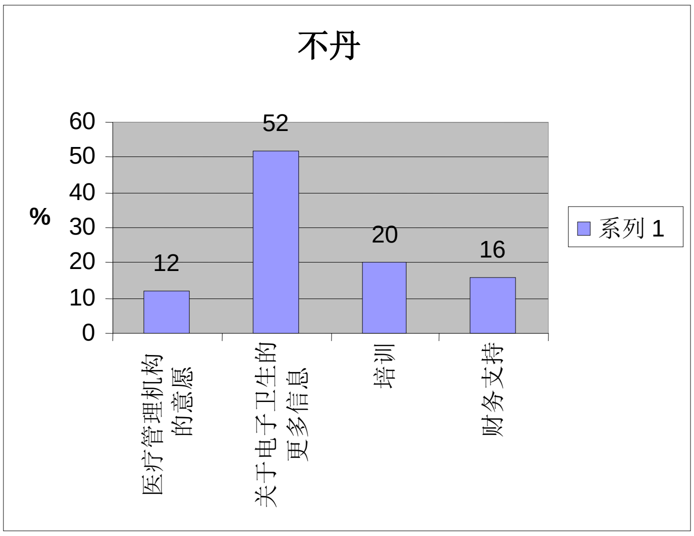


了解巴基斯坦的医务工作人员通过何种方式获得有关电子卫生的信息，这也是很有价值的。下表说明了这一信息。医学教育培训的作用依然很低。目前只占 23.42%。目前，继续医学教育计划（CME）未提供电子卫生方面的培训。电子卫生/远程医疗帮助提供卫生保健的能力使距离以及人员是否在现场变得无足轻重，这一点对发展中国家很有吸引力。

不丹

不丹是个小国，该国总人口只有 80 万，其中约有 80%的人生活在人口稀少的农村地区。全国总共只有 122 名医生，医生/人口比率约为 6667:1，以任何标准衡量，这一比率都是极低的。基本的卫生保健系统由国家培训的医务辅助人员运行。卫生部了解有关电子卫生的益处，并认为电子卫生是满足农村和偏远地区人口的卫生保健需求的一种有效战略，并且能够改善服务质量和可持续性。在国际电信联盟和世界卫生组织等国际组织的支持下实施的几个小型远程医疗示范项目让不丹尝到了甜头。卫生部信息通信技术主管 Lungten 女士与不丹的医务工作者进行了访谈。她向 16 名医务工作者（包括医生和医务辅助人员）询问了对于电子卫生的看法。受访者来自首都廷布以及 Lhuntse、Trashi Yangtee、Trongse、Bumthang 和 Gelephung 的五个地区医院。仅有 31%的受访者对第一个问题做了肯定的回答。这意味着仅有 31%的医务工作者了解电子卫生。在对电子卫生做了简要的介绍后，87.5%的医务工作者认同电子卫生对不丹很有益。对第四个问题的回答见下图 3。

图 3：



专家组已经取得了在一些发展中国家起草电子卫生总体规划的经验，并愿与其它国家分享这方面的知识。在现有电信基础设施的基础上，电子卫生总体规划将对可以提供哪种类型医疗服务的咨询进行证明。之后，医疗机构将根据当地的需要和工作重点选择相关服务。在实施此类战略规划是，必须采取几种通用步骤。电子卫生总体规划的总体结构见以下图 1。

表 1：

	频率	%	累计%
医疗培训期间	26	23.42	23.42
继续医学教育	3	2.70	26.12
医学杂志	10	9	35.12
报纸	6	5.4	40.52
电视	8	7.2	47.72
会议/研讨会	7	6.31	54.03
同事	16	14.42	68.45
来自本次调查	22	19.82	88.27
其它	3	2.7	90.97
互联网	1	9	91.87
未答复	9	8.13	100
总计	111	100	

获得的结果清楚地表明，发展中国家需要获得更多的有关电子卫生服务的信息。这些国家了解引进电子卫生服务对于发展中国家的重要性，但它们需要了解更多的信息以便加快落实进程。受访者反复强调，在采纳并广泛实施电子卫生服务的过程中，教育将发挥关键的作用。目前存在的主要障碍是缺乏资金。电子卫生服务可基于现有资源逐步加以实施，问题在于医疗部门的决策者并不完全了解在医疗业务中应用现代信息技术的益处。为了获得政府部门及其它决策机构的支持，有必要制定一项《国家电子卫生总体规划》。

解决方案 – 国家电子卫生总体规划

2005 年 5 月，世界卫生组织在第 WHA58.28 号决议中对电子卫生表示了正式认可，并向各国建议“考虑制定一项长期的战略规划，以便在卫生部门的各个领域发展并落实电子卫生服务”。由于电子卫生服务的技术平台必须依托电信网络，战略规划要求卫生保健和电信部门之间开展良好的合作。这对发展中国家而言特别重要，因为电信专家能够就如何利用现有网络提供专业咨询意见。

国际电联 ITU-D 第 2 研究组第 14 号课题“电信在电子卫生保健中的应用”专家组为来自发展中国家的受训人员制定了一个“如何落实电子卫生解决方案”的特殊培训课程。在 2008 年 4 月 16-18 日于卢森堡举行的电子卫生、远程医疗和卫生信息通信技术（医疗电信）国际教育和网络论坛期间，首次成功地采用了该培训课程。

在现有电信基础设施的基础上，《电子卫生总体规划》将提供可以组织哪类医疗服务的意见。之后，医疗管理部门可根据本地情况和工作重点选择这项服务。实施此类战略规划需要采取若干通用的步骤。下文提供了有关《电子卫生总体规划》结构的总体建议。

一个国家的地方电子卫生政策必须与该国正在实施的总体信息政策和总体卫生行业政策保持一致。有必要针对各国的国情制定《电子卫生总体规划》。这是一项有关国家电子卫生政策的文件，它将指导并协调所有电子卫生项目和活动，以帮助消除不同的远程医疗系统之间的互操作性问题。

内容摘要

《电子卫生总体规划》主要问题概述

1.1 引言

- 目的和范围（简要说明制定《电子卫生总体规划》的理由）。
- 卫生部的愿景、使命和目标。
- 满足电子政务的目标。

1.2 国际最佳做法

- 概述一下在其它国家成功实施的类似的电子卫生系统和服务，这些事例对贵国可能会有帮助。
- 法律及安全问题。

1.3 卫生保健领域当前的状况

- 组织结构（介绍卫生部的总体结构。公共和私营医院及诊所）。
- 卫生部提供的服务及所使用的服务提供渠道。
- 客户分析（有关公共和私营部门服务用户的综合信息）。
- 卫生保健机构的计算机化水平。
- 现有医院信息系统的具体情况。
- 提供每种具体的医疗服务的信息流方块示意图，包括与其它部门和组织之间的关联。

1.4 卫生保健领域面临的问题

- 缺少医务工作人员？
- 缺少设施？
- 医疗服务当前状况和理想状态之间的差距分析，详细说明达到理想状态的方法和解决方案。

1.5 电子卫生的作用 – 全球展望

- 改善对生活在农村和偏远地区的人口的卫生保健服务。
- 改善医疗机构之间的合作，以便更有效地提供服务。
- 有形和无形效益。
- 具成本效益的解决方案，包括医务辅助人员能够即刻从远方的医生那里获得专业意见，患者能够在本地得到治疗。
- 对于患者而言，节省了性命攸关的时间和诊断费用。
- 通过部分地利用电子学习方法可为医务工作人员组织继续医学教育（CME）。
- 通过远程医疗网络获得其他医生或专家的第二种意见，可减少医疗错误。
- 现有医务工作人员的效率得以提高。
- 电子病历的广泛引进。

1.6 现有的电信基础设施

- 网络数字化水平。
- 光纤传输网络。

- 数字微波网络。
- 互联网以及联网医疗机构的数目。
- 在农村地区无障碍接入互联网的能力。
- 移动网络。

1.7 电子卫生网络

- 建议的基于现有电信基础设施的全球电子卫生网络结构。
- 建议的首都城市电子卫生网络。
- 建议的农村电子卫生解决方案。

1.8 电子卫生服务

- 建议的针对不同卫生保健水平及不同医疗机构提供的电子卫生服务项目清单。
- 客户分析（谁是当前的核心客户，这些客户都有哪些期待）。
- 各项建议的服务的理想信息流（理想流程的方块示意图，各流程所需的时间及所使用的服务提供渠道的方块示意图）。
- 建议的系统架构（包括系统主要物理组成部分的方块示意图：个人电脑、服务器、路由器、调制解调器和通信链路）。
- 与医疗诊断设备连接的接口。
- 不同医疗机构中电子卫生系统之间的互操作性。
- 电子卫生的技术标准化。
- 国际电信（如需要）。

1.9 电子卫生培训

- 编写有关电子卫生服务的执业守则。
- 医疗和技术工作人员的培训
- 采用预期和实际数值确定各项指标，以衡量实施的成功程度。
- 法律和安全性问题。

1.10 市场营销

- 确保每种电子卫生服务均能受到客户欢迎，并确保得到政府层面或卫生部用户的肯定。
- 需要制定可行的市场营销计划，确保被广大公民所接受并获得政府的肯定。

1.11 与其它组织的合作

- 与私营部门和非政府组织/自愿组织通力合作。
- 在提供服务的过程中，与战略合作伙伴机构可开展哪类协作？与客户机构可开展哪类协作？
- 项目预算——取决于选择哪些医疗服务引入电子卫生网络。
- 实施过程。
- 需要任命整个项目的高级负责人（例如，首席信息官），以及专项服务负责人及专门的管理团队。
- 须拟定监督和审核机制。

- 在政府批准的《电子卫生总体规划》的基础上，有必要在各医院及任何其它医疗机构层面提供落实电子卫生服务的战略规划。这些文件将指导卫生管理部门以协调有序的方式组织落实电子卫生的各项工作。
- 立法方面的差距以及适用电子卫生服务规则的不确定性对医患双方均构成法律风险。亟需制定电子卫生执业行为守则。
- 从更大的角度来看，电子卫生不仅意味着技术发展，而且形成了一种新的工作方式、一种态度以及对网络化、全球化思维的承诺，从而利用信息通信技术改善本地、区域和全球范围的医疗卫生状况。信息通信技术清除了距离和时间障碍，使医疗卫生信息和知识得以自由流动，并提供及时、高质量以及专业医务工作人员的相关信息，从而架起知与行的桥梁。

结论

- 如果不与电信行业开展密切合作，发展中国家将无法加快实施亟需的电子卫生服务。
- 发展中国家急需制定战略性文件——《电子卫生总体规划》，使卫生保健领域的决策者能够全面了解医疗卫生技术所产生的效益。
- 发展中国家需要有关如何利用移动和固定电信基础设施引进电子卫生服务的技术指导原则。
- 发展中国家需要在这一领域开展更多的培训和能力建设。

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阿尔及利亚：技术发展促成了创新的卫生保健解决方案，满足边远地区的迫急需求

M. Zerroug [1], *Z. Sari* [2]

引言

数年来，我们一直在开展一项以自由职业者为基础，在阿尔及利亚全境提供干预性消化内镜特别治疗的实验性项目，此前对此已有报告。

该项目允许专家们为居住在边远地区的病人提供医疗服务，由此无需再长途跋涉到位于国家北部的医院。实践证明该方法是具有成本效益的，因为它为病人节约了自己及陪同家属需要在昂贵的差旅和食宿方面花费的时间和金钱。在初始阶段，我们设立了一个移动消化内镜单元并将我们的专长重点集中在三个目标上：1 – 紧急情况管理；2 – 例行诊断和手术消化内镜以及 3 – 观察有消化系统慢性病的病人。除提供手术消化内镜手术外，我们也需要检查大量有急性、良性和慢性消化系统疾病的病人。前两类的绝大多数病人都被转至当地全科医生，并给予了建议。特别照顾了有慢性病的病人。这些慢性病病人没有获得足够的治疗，其原因包括当地缺乏医疗专家以及社会和经济条件匮乏等。这些慢性症状包括炎性肠病（IBD）脂泻病、肝脏和胰腺慢性病以及消化瘤等各种消化系统疾病。众所周知，IBD 的这些症状可能会带来沉重的财务负担。公共卫生部门正在努力向有慢性疾病的病人提供医疗设施。向定期购买公共保险的病人免费发放了药物，但边远地区的贫困、失业和医疗专家的匮乏削弱了这些努力。该方法使得他们可以在家居住，并得到当地医护人员的积极协作，由他们照看其健康状况。这种随访将防止或诊断出疾病的突然发作或药物的副作用，无需在不必要时住院治疗。

材料和方法

由于缺乏治疗，有慢性疾病的病人绝大多数在就诊时都具有一定程度的严重性。这就需要快速入院，以接受精心检查并开始包括各种药物在内的药物治疗。这些病人中的很多都是文盲，这就需要更多的时间向其说明并解释病程。此外，由病人和/或护士根据随访的临床情况填写的病例也随同给当地全科医生和护士的转诊信一起提供给他们，并包含了我们的联络信息（移动电话号码和电子邮件地址）。一般而言，开始治疗后，每天通过电话或电子邮件（当病人可以收取电子邮件时）进行随访。也请病人在任何需要的时候联系我们。根据我们的巡诊计划，制定了固定的详细治疗方案。包括的病人以及疾病类型述于一个表格中。

结果和讨论

绝大多数病人都具有积极主动性并严格遵守了给他们提供的建议和意见。平均的随访时间约为 24 个月（从 36 到 6 个月）。在当地全科医生和护士的积极配合下进行的远程监控防止了许多由于所服用药物的副作用或疾病的自然史而可能出现的并发症。病人或全科医生或护士寻求治疗建议的所有电话都得到了回复。也采用了短信（SMS）来提供药店所需的正确处方。本研究中，几乎所有病人都居住在边远地区。根据我们开展该项目的承诺和意愿处理了拨打电话的问题。慎重考虑了电话费用问题，以便将其降至最低。

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此项报告我们经验的工作旨在通过将流动的专业人员等组织起来，并通过移动电话最新的技术发展以及国内空中和地面交通基础设施的改进在当地提供卫生保健。其中的一个部分是一项公开研究，确定通过移动电话在边远地区远程监控慢性消化疾病的可接受性和可行性。提取了以往的相关数据并说明了明显的偏差。与 S.Bali 不一样，电话呼叫数量、可靠性、一次呼叫的平均时长、费用等参数未考虑在内。尽管接到了一些骚扰电话，该系统的可持续性依赖于我们开展该研究的承诺和意愿。能够取得成功的最主要因素是移动电话的广泛普及和使用（超过 2 700 万部），使得在任意时刻与各方进行交流成为可能。卫生专业人员对移动电话的使用包括病人监护、疾病观察和预防，对于像阿尔及利亚这样一个有着 3 600 万居民的国家而言，这正变得极其重要。该国正面临着医疗保健基础设施和人员不足且分布不均的问题。我们经验的一项附带作用是培训了在边远地区工作的医生和护理人员，提高了他们的技能水平。根据从这项仍在继续进行的研究中获得的经验，我们赞同世界卫生组织助理总干事 Howard Zucker 博士曾经说过的话："发展中国家移动电话网络的爆炸式发展为显著地改变各国应对全球卫生挑战的方式创造了一个独一无二的机遇。"但是，在一项对与远程监控四种慢性疾病相关结果的属性和程度进行大型、系统化的回顾中，G. Pare 和所有人得出结论，未来的研究需要获得与其治疗效果、成本效率、对服务使用的影响以及卫生保健提供商的接受程度等有关的证据。

慢性疾病与年龄、性别和本地化有关的分布见以下表 1。

表 1：

	IBD n=95 克罗恩病 43 溃疡性结肠炎 52	**腹腔疾病 n=12**	**肝脏疾病 n=36**	**慢性胰腺炎 n=2**	**内窥随访 n=60**
平均年龄（岁） 范围（岁）	31 18-53	32 27-38	39 27-58	44 42-46	53 34-74
男女比例 男/女	1,5/1	1/3	1/3	2/0	2/1
本地化以及疾病的其它方面	LB 29; Proctitis 25； SB 07; LB, SB 18； 肛周 07； 全结肠炎 09	GFD 单独 08 抗体 04	代偿性 PBC 2, AIH 2; 代偿失调 32		异时肿瘤病变 neoplastic lesions:LB 息肉 56; 家族性息肉病 04

缩写语：IBD 炎性肠病；M：男；F：女；y：岁；LB：大肠；SB：小肠；GFD：无麸质饮食；PBC：原发性胆汁性肝硬化；AIH：自身免疫性肝炎

结论

该项研究的结果表明，无论其受教育状况，社会经济地位和年龄有何差别，病人通过移动电话的使用服从了远程监控。对慢性疾病进行远程监控似乎是一种有希望的病人管理方法，该方法可以降低其卫生保健费用上涨造成的财务负担。

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用于电子卫生应用的新电信技术

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引言

在发展中国家和发达国家的本地、各州邦和国家层面，各级政府都面临着控制不断上涨的卫生保健费用，提高保健质量以及使更多人获得卫生保健服务的问题。他们也必须提供监控公共卫生和最大限度地控制传染病流行等传统职责。

实现这些目标需要进行大量的沟通并收集和分析信息 – 在某些情况下还需要跨越政治和物理边界进行合作。基于英特尔公司技术的解决方案帮助公共卫生保健系统实现其向公民提供更好保健的目标。英特尔公司与全球各地政府和卫生保健系统进行磋商，了解其独特的问题，以便我们能与他们共同应对。我们带来了领先的技术、独特和独立的视角、对开放标准的坚定承诺以及帮助各国和各行业采用数字技术来改善卫生和卫生保健的丰富经验。

解决方案、技术和专长来帮助各级政府：

- 加速临床医生采用可以提高生产力并改进卫生保健质量的数字技术；
- 增加公民获取高质量、具有成本效益的卫生保健服务的机会；
- 通过更有效地部署稀缺资源、优化工作流程并在有需求的地区提供最新信息来提高效率并降低成本；
- 优化卫生保健信息技术的使用，影响临床和政策目标。

例如，我们协助各国政府设立了帮助医生、社区护士以及其他卫生保健工作人员电子录入数据、在需要时获取临床数据以及实时与其他提供商进行协作的实用项目。这些政府资助的购置项目（包括员工购置项目在内）可以协助改善卫生保健质量、控制不断上涨的卫生保健费用并提高高级技术工人的生产力和工作满意度。

英特尔热衷于技术改善全球卫生和卫生的能力。世界各地的卫生保健费用都在上涨。很多人无法获得高质量的卫生保健服务。纸质的工作流程引入了误差并妨碍了生产力的提高。人口的老龄化和不断上涨的老年疾病比率甚至有可能会压垮最有效率的卫生保健系统。英特尔正在提供创新的数字技术进步来应对这些挑战。我们与卫生保健的领导者有着共同的愿景，认可技术在促进卫生保健向更加主动的、以消费者为中心的保健模式演进以及在提高卫生保健质量、降低其费用并提高可获取性方面有着很大的潜力。在家庭、医院、诊所和药房中，我们与卫生保健行业的领导人一起合作，更好地连接人们和信息并促成新的保健模式。

通过帮助个人、家庭以及扩展的卫生保健界在适当的时候连接到恰当的信息，我们使其可以做出更好、更有依据的决定 – 以加速彻底改善卫生和卫生保健的能力。

卫生保健中的信息技术

英特尔公司的创新为企业提供更加有效的帮助 – 无论该企业是一家卫生保健系统、医院、诊所、生物医药公司、付款人、政府机构或是卫生主管部门。

我们正在与全球的卫生保健领导者一起整合卫生保健信息环境。我们的解决方案、技术和协作的专长使得卫生保健组织可以更好地管理卫生保健信息并使人们在其生活中改善身心健康成为可能。

通过新的和重要的方式来连接人们和信息，我们使得卫生保健组织可以提供质量更高、更容易获取且更加经济的保健并满足其医学和商业目标。

关于卫生保健企业中的所有利益攸关方如何从我们的工作中获益，请参见下文。

- 卫生保健提供商可以改善其保健质量、工作流程、费用和可获取性。
- 生物医药公司可以加速药物发现并优化电子医疗的实验。
- 付款人可以提高卫生保健的质量和成本，同时发展成为卫生服务。
- 政府和卫生部门可以更低的成本向更多的人提供更好的保健。

卫生保健提供商（实现整合的数字医院）

卫生保健提供商每天都面临着提高保健质量、优化工作流程以及改善对服务的获取等问题。信息技术可以在实现目标的过程中发挥重要作用，包括使得提供商可以实时地获取数字化的信息，以改善医院的决策。

数字技术正在被证明是获得整个卫生保健系统中当前指令、医学图像、病史、处方、医嘱和其它重要数据信息的重要工具。但是部署电子病历和其它数字卫生技术，要求的不仅仅是硬件和软件。向一个集成的数字医院的转变需要可互操作的、标准化的数字技术、完整的解决方案、仔细的规划以及重大的文化变革。英特尔公司与全球卫生保健提供商一起应对这些挑战。我们推动标准和互操作性，而且我们设计用于安全并及时交换卫生保健信息的技术。我们使得在整个卫生保健生态系统“医院和诊所、病人、付款人、生物医药公司以及卫生保健界其它成员之间安全地共享数字信息成为可能。

通过与世界各地的卫生保健领导者和临床医生合作，我们倾听并了解未能满足的信息技术需求，使信息系统与商业目标相匹配并根据卫生保健的独特需求定制解决方案和平台。我们所获得的经验帮助我们的卫生保健客户更加有效地连接人、流程和信息，以：

- 改进医院的决策和保健的质量；
- 提高病人的安全；
- 降低成本；
- 提高对卫生保健的获取；
- 改善工作流程、提高生产力和经营效率。

个人远程医疗

纵观全世界，人们的寿命越来越长并在努力地独立、快乐并健康地生活。与此同时，我们也看到人们患上糖尿病和充血性心力衰竭等慢性疾病的数量正在急剧增长且管理和治疗这些慢性疾病的相关高昂费用也在不断增加。

卫生保健界正在寻求应对这些挑战的新方法。临床医生、付款人和其他人正在寻求可以实现以下目标的方法：

- 病人住在家中；
- 病人与临床医生一起实现最好的结果；
- 从整体上对病人进行检查，包括其健康状况、社交网络以及其个人的能力和偏好。

在近十年的人种和健康研究作为后盾之后，英特尔公司认为个人远程医疗技术的创新将开启一个病人管理的新时代，该新时代以展望新的保健交付方式为标志。为实现该愿景，我们致力于开发技术，更好地照顾年老和长期患病的个人 – 基于这些人群特定需求并被设计用来允许人们体面地变老并在其健康管理中发挥更积极作用的个人健康解决方案。我们希望并期望，这些在远程医疗方面取得的进步将允许人们在其家中即可舒适地享受信息的真正力量 – 将信息变为行动和更好的健康结果。疾病管理进入了卫生保健领域，带来了帮助医生、病人和卫生保健组织通过协调的和积极主动的介入来改善结果并控制费用的希望。该希望仍有待实现，因为已经证明我们复杂的卫生保健系统所面临的问题很难克服。

疾病管理专业人士处理以下几个核心问题：

- 介入病人的健康管理；
- 处理多个和同时存在的慢性疾病状况；
- 支持医生的决策；
- 利用数据来确定早期和恰当的介入。

目标非常明确：让病人更健康并更加有效地使用资源，从而在全系统获得成本收益。所缺乏的是一种更易于分享和使用数据的方法，从而使适当的人在合适的时间获得正确的信息，以改善结果并降低费用。

技术进步正在帮助疾病管理的希望变得更加可能实现。新的个人保健系统技术将允许在医生、病人、保健管理人员和家庭保健工作者之间能够真正地建立轻松、互动、接近实时甚至实时的链接。通过引入在家庭中即处理病人以及允许及时进行医疗和教育介入的用户友好技术，个人保健系统技术可以协助疾病管理更加贴近其创立所依据的目标。

远程病人监控的演进

远程病人监控技术设备已出现多年。它们执行简单但重要的任务，如记录并发送病人重要的体征、分享教育内容并提供有用的提醒。

但是，自从首次引入这些设备以来，病人和卫生保健专业人士的期望已经显著改变了。现今，人们对技术的期望更高，而不仅仅是监控标准重要体征的能力。幸运的是，远程医疗技术正在发展，以便向病人和卫生保健专业人士提供实时、互动、数据充分的保健管理系统，从而在治疗慢性疾病的过程中使病人及其保健管理团队更多地进行介入。新一代的个人卫生保健技术被设计用来满足保健的当前模式。其目标是提供一种与病人合作的、更加积极主动并持续的方法。为实现这一重要目标，下一代个人卫生保健技术必须是一种集成的疾病管理系统，且：

- 根据病人和临床医生的需求特别设计。
- 为病人提供自我管理工具，以便在其自身的保健中发挥更加积极的作用。
- 提供连接病人整个保健团队的通信工具，以便更好地进行协调。

个人保健系统等新的个人远程医疗技术是提供实时通信和综合数据报告等使得“消息灵通且积极主动病人”与其卫生保健提供商保持联系的希望所在。个人保健系统可以通过提供与现有系统和方法相兼容的强有力且灵活的工具来支持保健团队。病人和卫生保健专业人士可在家中持续获得个人保健系统，因此他们可以提供更加完整的病人状况。

远程医疗案例研究

移动救护车 – 土耳其（WiMAX – 三合一业务）

英特尔土耳其分公司和土耳其电信成功地演示了如何采用 WiMAX 实时从运送病人的救护车向医院的急救室发送信息。英特尔公司在土耳其首都安卡拉的 Numune 医院进行了该演示。救护车和医院之间的通信采用移动 WiMAX 无线接入技术进行连接。在去医院的路上，通过 WiMAX 从救护车向医院发送了病人的人种信息和健康状况征兆以及 12 导联心电图数据。

中国（卫生保健）

广东省位于中华人民共和国南部沿海地区，65%的土地为农田，其农村主要位于山区。尽管广东的国民生产总值（GDP）总量在各省中排名第一，占其总人口 40%的农村地区在 GDP 总量中只占 22%。这些农村人口的村庄偏僻且交通不便，这经常被作为农民的发展跟不上该省其它地区发展的原因之一。另一个抑制发展的因素是相对于城市较低的 IT 使用和能力水平。广东在农村发展中遇到的问题并不是唯一的。中国政府已经发起了新农村举措来改善该国 8 亿农民的基础设施、教育和医疗保健系统。信息技术将在中国的教育和卫生保健承诺中发挥重要的作用。

在广东的农村地区设立了交通便利的电子社区中心。省政府资助了中心的用地。英特尔公司提供了设计和安装并监督 IT 销售商。中国电信等业务提供商提供了互联网连接。当地计算机生产厂商提供了系统和劳力。到 2007 年第一季度，设立了 1 100 个中心，2007 年底之前还要部署另外 9 000 个中心。这些政府监督的中心通过 ADSL 向社区提供了宽带互联网连接。英特尔公司为发展中国家设计的 PC 平台（如与中国信息产业部一起为农村农民设计的农村 PC），甚至在不能可靠获得电力供应的地区也提供了计算能力和接入。可以在现场为中心的访问者提供培训，许多访问者是首次使用计算机。通过英特尔公司为电子社区中心使用而专门开发的农村信息门户网站提供了，与当地相关的内容 – 如农业交易信息和农耕技术以及土地登记和政策的电子政务服务。

在湛江市建立了首批两家数字卫生保健诊所。英特尔公司带来了硬件和软件销售商，开发可以在一个网络上实现病人挂号、药房、门诊医生站、护士站、化验室、小型影像归档和通信系统（mini-PACS）以及其它等所有主要诊所要素的系统。电子病历（EMR）在病人的治疗过程中实现了无缝过渡和安全传输。EMR 还使得重要信息可以在紧急病例转送到医院的过程中从诊所上载到救护车。而且一个远程医疗组件为当地居民提供了访问城市医院专家的接入，包括低成本远程诊断。

黎巴嫩（远程医疗 – WiMAX）

WiMAX 网络加速了采用技术和高速计算机连接来访问互联网广阔的知识资源。在两家医院、一所学校、两家位于奈拜提耶（Nabatiyeh）的 Burj Al Barajneh 和贝鲁特的两家社区中心部署了 WiMAX 系统。长距离无线技术被视为是一种在不太适合安装线缆或电话线的山区和边远地区实现连接的更加有效的方法。

英特尔公司也在黎巴嫩最好的医院之一 – 贝鲁特美国大学医疗中心（AUBMC）以及位于奈拜提耶的奈拜提耶政府医院不断加强远程医疗项目的技术和医生培训支持。远程医疗系统为医院提供了相隔数公里的医生之间进行实时视频会诊、分享数据并远距离对病人进行诊断的能力。如果没有远程医疗，需要专家进行诊治的奈拜提耶市民将不得不去贝鲁特，这样的旅行可能费时且费力。这种创新给予了当地医生获取最新的医疗数据并从远在数百公里之外的专家和医疗中心获得不同意见的能力。

埃及（远程医疗 – WiMAX）

Oseem 是一个靠近尼罗河谷，人口 20 万左右的偏僻城市。该城市距离开罗 1 个小时的车程，这个仍保留传统习俗的农业城市与现代社会相比恍如是两个世界。牛、山羊、绵羊和骆驼在土路上与汽车并行。尽管屋顶上稀稀拉拉地散布着卫星电视天线，PC 技术的缺乏阻碍了社区的发展。非常简单的政府事务可能需要花费数个月的时间。文盲仍是一个令人关注的问题，因为这是一个全国普遍存在的现象。此外，Oseem 的很多农村地区无法获得卫生保健。

该城市被选为“数字村庄”的样板，以展示具备成本效益的基础信息通信技术可以如何促进发展并改善生活质量。英特尔公司与政府以及各种私营和公共伙伴一起工作，以下列三个关键领域为重点：电子政务、教育和卫生保健。采用 WiMAX 连接，成功地将信息技术引入到社区中。在数周之内即设计并部署了 Oseem 数字村庄。

在 Oseem 试验了 WiMAX 解决方案。政府和当地分销商密切合作，设立了可以作为未来 WiMAX 台站蓝图的具备成本效益的解决方案。这种新连接实现了一个电子政务信息站的安装，为 Oseem 居民和企业提供了 700 多种政府服务的轻松接入。

由于实现了数字化，采用了一个现有的医疗小分队来设立具备成本效益的移动远程医疗解决方案。这使得居民可以在不需要费时费力去开罗的情况下就可以获得专门的医疗保健。可以在农村诊所中采用类似的设置来补充目前现有的基础卫生保健。

巴西（远程医疗 – WiMAX）

拥有 10 万人口的 Parintins 是亚马逊丛林中央的一个“孤岛城市”。该城只能通过飞机或乘坐 12 个小时的船才能进入，是一个由于位置非常偏僻而面临问题的典型范例。由于没有道路且基础设施有限，教育和卫生保健遇到了困难。该地区 190 所公立学校和社区中心中只有 61 所学校有电力供应。只有一所学校拥有电脑而且只是一台拥有 64K 连接速率的计算机。该地区只有一家医院，对于许多人而言，这是一段困难且费用高昂的旅途，而且城市的医生发现很难提供价格可承受且质量有保障的医疗保健。

在与巴西政府、企业和教育官员合作形成的公共 – 私营部门合作关系中，英特尔公司规划并领导了为一家主要卫生保健中心、两所公立学校和一家社区中心安装先进 WiMAX 网络的工作。向这个项目作出重要贡献的公司包括 CPqD（计算机实验室和网络安装）、Embratel（提供卫星链路业务和 WiMAX 网络的运行）、Proxim（捐献了 WiMAX 用户端设备和基站）以及 Cisco（捐献了 Wi-Fi 接入点）。

在卫生保健方面，Parintins 正在从 Manaus 的一个远程医疗诊所中获益，这将成为 Parintins 医生的第一个切入点资源。该诊所由亚马逊国立大学和亚马逊联邦大学设立。巴西的远程医疗领先者圣保罗大学（USP）提供了软件工具和“virtual man” – 一种人体计算机图像再现的使用。USP 还提供了持续的教育和更新课程。现在，医生们具备了视频会议的能力，这使他们可以更快更好地获取最新医疗数据，帮助应对在该地区肆虐的疾病。Gregorz Maciejewski 医生表示：“皮肤活组织切片结果需要两个月才能收到。现在，借助于这个摄像头在无线系统上发送图像，可以在一个小时内完成诊断。我认为这是一个巨大的飞跃，非常棒的结果。”

印度（远程医疗 – WiMAX）

Baramati 距离普纳（Pune）约 120 公里，是几个村庄的行政中心，它的经济以农业为主。Baramati 的基础设施良好，有道路、水和各种设施 – 这在很大程度上要归功于农业、消费者事务、食品和公共分配联合部长 Sharad Pawar 先生，他是本地人。这个小城也以印度最大的奶牛场而闻名，每天可以生产一百万升牛奶。

一个新的社区服务中心以可提供互联网接入和服务的信息站为特色。WiMAX 在无线环境中实现了宽带速度，而由英特尔 CPU 驱动的计算机，甚至在没有可靠电力供应的地区也提供了计算能力和接入。该城市新 PC 接入的一个惠益者是拥有 100 多个妇女假期自助小组的网络。

实施了一项数字社区健康中心，只有眼科和心脏远程诊断的功能。中心在心脏和眼科治疗方面以大大低于城市地区的费用提供专门的保健服务 – 有时费用减少 25 倍以上。该举措涉及了卫生保健合作伙伴 SN Informatics and Schiller Healthcare，以及第三级保健提供商 Narayana Hrudyalaya 和 Aravind 眼科医院，并得到了 Baramati 本地主要的机构 Vidya Prathisthan 信息技术学院（VIIT）的支持。社区健康中心取得了明显的成绩，在运营的前四个月就收治了 11,000 病人。

尼日利亚（远程医疗 – WiMAX)

英特尔公司 2007 年宣布了一项旨在改善尼日利亚一亿四千万人口教育、卫生保健和经济发展的综合数字包融项目。

在联邦卫生部的支持下，英特尔公司发起了一项远程医疗试验项目，为向拥有四百五十万人口的地区提供服务的一家农村医院提供亟需的小儿科护理。在英特尔公司的支持下，Bida 的医生们现在可以随时地与阿布亚的小儿科和外科专家通过新远程医疗系统进行咨询，该系统以通过 WiMAX 的视频会议和高速带宽链接以及长距离无线技术为特征。试验使得医生可以缩短抵达病人并对其进行治疗的时间和距离。系统将尼日利亚旗舰医疗机构之一的、位于阿布亚的国立医院与位于 Bida 的联邦医疗中心连接起来，后者是拥有 200 个病床的农村医疗设施，距离是四个小时的车程。到目前为止，需要从 Bida 转院的病人不得不旅行至少 250 公里才能找到专家 – 后者是绝大多数人无法承受的一种旅行。

Bida 亟需儿科医学专家的保健。在项目的第一阶段，胎儿监控能力将允许幼儿医生远程并更快地与医务人员进行会诊并检查孕妇来监控其妊娠进展情况。英特尔公司也在两家医院培训医师和技术专家来使用新的技术工具。

印度：印度现有的远程医疗基础设施、网络、应用

S K Mishra [1], *L S Sathyamurthy* [2]

引言

印度幅员广阔，人口超过十亿，但仍在努力改善其恶劣的卫生状况。城市和农村基础设施远程医疗之间存在的巨大不平衡性使得卫生服务有着巨大的希望。在过去的八年中，已经实施了数项举措来采纳各种电子卫生服务。这些举措见下文所述。

印度医院信息和管理系统（HIMS）

这个国家的绝大多数医院还基于人工处理，这就非常难以接入。保险行业要求实现更加有效的信息存储和获取。单单自动化就可以帮助医院应对这些挑战。高级计算发展中心（CDAC）、Wipro GE 卫生保健、Tata 咨询服务（TCS）和西门子信息系统有限公司（SISL）等大型 IT 公司开发了许多强有力的标准 HIS 解决方案。目前，绝大多数社团医院和一些政府医院正在部署 HIMS。一家独立自主的政府 IT 组织 CDAC 与勒克瑙的圣 – 甘地医学科学研究生院（SGPGIMS）合作，于 1998 年开发并部署了第一个完整的 HIS 软件。

电子卫生保健服务

卫生保健是一项国家性工程，采用的是三级体制 – 服务于一定数量乡村的初级医疗中心和位于地区的二级医疗中心，而位于大城市里的医科大学附属医院则是三级中心。此外，还包括一些为数不多、在某些高端及临床、教学和科研于一体的国家级高级医疗机构。除了政府医疗系统外，私人部门在卫生保健服务中也采取了同样的体制。尽管卫生保健系统网络比较发达，但农村地区接入卫生保健系统还是差强人意。国内和国外的几个案例研究已经证明：远程医疗的技术能力可以满意地从第三等级通过第二等级向第一等级转移与病人护理、卫生保健提供商和管理部门专业和技能发展有关的知识和信息。这不仅将培训医生，还将改善这些层面病人护理的质量。政府和私营部门都在通过提供通信连接，用于卫生保健的硬件和软件解决方案来涉足远程卫生保健领域。以下总结了其中的一些活动。

印度空间研究组织（ISRO）

印度空间研究组织（ISRO）按照 GRAMSAT（农村卫星）计划正在部署远程医疗节点。它与各邦政府合作建立了一个包括 225 所医院 – 185 个边远/农村医院的远程医疗网络。地区医院/卫生中心连接到位于大城市的 40 所大型专门医院。遍布全国的 225 个远程医疗接点的分布如下：安得拉邦 (13)、安达曼私尼科巴群岛 (4)、比哈尔邦 (1)、孟加拉邦 (6)、Chattisgarh (16)、古吉拉特邦 (1)、喜马偕尔邦 (1)、哈里亚纳邦 (2)、恰尔肯德邦 (1)、查漠和克什米尔 (12)、卡纳塔克邦 (25)、喀拉拉邦 (26)、拉克沙群岛 (5)、中央邦 (1)、马哈拉施特拉 (4)、东北邦 (21)、新德里 (4)、奥里萨邦 (3)、旁遮普 (4)、Pondicherry (5) 拉贾斯坦邦 (32) 泰米尔纳德邦 (13)、北方邦 (3)、北安查尔邦 (1) 和其他 (21)。超过 225 000 位病人通过 ISRO 项目获得了远程会诊和治疗。

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印度政府信息技术部（DIT）和通信信息技术部（MCIT）

DIT 已经在全印度设立了 75 个以上的节点并支持以下方面的研发：

由 C-DAC 为三家主要的医疗机构 – 即 SGPGIMS（勒克瑙）、新德里全印医学科学研究所（AIIMS）以及昌迪加尔医学教育和研究院（PGIMER）开发和验证的远程医疗软件系统，所使用的是 ISDN 和卫星连接。

利用 Webel 公司（加尔各答），位于克勒格布尔（Kharagpur）的印度技术研究院以及热带医学学院共同通过广域网（WAN）对孟加拉邦的热带病进行诊断和监测（两个节点）。

在 Trivendrum 区域癌症中心（RCC）的外围医院建立了喀拉拉邦肿瘤网络，提供癌症监测、治疗、缓解疼痛、患者随访和持续保健方面的服务（5 个节点）。

为了给印度东北各邦的偏远地区提供专业医疗服务，在 Marubeni 印度有限公司、那加兰邦政府和新德里阿波罗医院的支持下，已经为那加医院（科希马）和米佐拉姆邦以及锡金邦提供了一套远程医疗解决方案。

以项目的形式开展了举措，以定义“用于卫生的信息技术基础设施的框架（ITIH）”，充分满足卫生保健行业不同利益攸关方的信息需求。

为将不同远程医疗中心的服务标准化，DIT[2] 起草了一份名为《印度远程医疗行业推荐指南和标准》的文件，该文件旨在改进在该国内设立的各种远程医疗系统之间的互操作性。这些标准将协助 DIT、各邦政府和卫生保健提供商规划并实施可操作的远程医疗网络。要建立远程医疗中心，应设定远程医疗系统、软件、连接、数据交换、安全和隐私问题等的标准。应制定指南来开展远程医疗互动。

与国家信息中心（NIC）合作，在东北各邦和锡金邦的 30 个地区采用 NICNET 初步设立了社区信息中心（CIC）。

卫生和家庭福利部（MoH&FW）

2005 年设立了一个全国远程医疗任务组，解决在远程医疗中出现的各种问题。各种专委会正在开展工作，制定一项全国政策文件并在 ISRO 的帮助下实施综合疾病监察项目。

根据全国癌症控制计划，卫生和家庭福利部建立了印度 OncoNET，这是一个连接 25 个区域癌症中心和 100 家外围中心的网络，提供全面的癌症治疗设施并开展癌症预防和研究活动。

经过批准的远程眼科项目向印度孟加拉邦、旁遮普、北方邦等农村和边远地区的病人通过远程眼科移动车提供专门的眼科治疗服务。

ISRO 还起草了全国远程医疗网的建议草案并已经提交 MoH&FW。

除此以外，政府和社团的一些专门医院以及各邦政府还支持了一些远程医疗项目（表 1）。

远程医学教育

在所有医学院传授合格的医学教育并在全国维持统一的标准不仅取决于采用监管部门所规定的统一课程，还要求获得合格的教师、知识资源、学习材料和教学技术等优秀的基础设施。尽管这些措施在发达国家都得到了保障和提供，由于财务和后勤方面的限制，在发展中国家并不是如此。在远程医疗和信息技术领域取得的进步提供了一个机遇，通过将学术医学培训中心与外围医学院联系起来，弥补知识差距，采用互动的虚拟教室、手术过程的视频会议、访问图书馆和网络教学活动等

形式实践远程学习。印度的情况与发展中国家没有什么不同。鉴于近期可以获得大量的空间和地面电信基础设施带宽，信息技术专业人员、必要的硬件和软件以及正在出现的网格计算技术，国家现在可以承受此类网络。过去的五年中，几乎没有三级医学学术中心介入了此类活动，结果令人鼓舞（表 1）。

表 1：专科医院超级远程医疗网络（公共和社团部门）

编号	大型专科医院	链接的远程医疗接点	资助和实施的机构
1	勒克瑙 SGPGIMS	奥里萨邦、北安查尔邦网络、地区医院、Raibareli、AIIMS、PGIME、东北 8 个邦、AIMS、科钦、SRMC、钦奈、CMC、Vellore、哈里亚纳邦 Rohtak 医学院	ISRO、DIT、奥里萨邦和北安查尔邦政府、燃气管理有限公司、CDAC Mohali、NIC
2	新德里 AIIMS	J & K 网络、哈里亚那（Rohtak 医学院、Ballabhgarh 社区中心）、Cuttack、 Guwahati、Chennai、Kochi	DIT, ISRO, C-DAC, Mohali
3	昌迪加尔 PGIMER	旁遮普和喜马偕尔网络、勒克瑙 SGPGIMS、新德里 AIIMS	ISRO、DIT 以及旁遮普和喜马偕尔邦政府
4	科钦的 Amrita 医学科学研究院（AIMS）	34 个节点	ISRO
5	孟买塔塔纪念医院	9 个节点和区域癌症中心	
6	班加罗尔亚洲心脏基金会	加尔各答罗宾德拉纳特•泰戈尔心脏科学国际学院、班加罗尔 Narayana Hrudayalaya 医院	ISRO
7	钦奈的 Shankar Nethralaya 医院、 马杜赖的 Meenakshi 眼科委员会和 Arvinda 眼科治疗中心	移动远程眼科	ISRO
8	阿波罗医院集团	在印度和国外有 64 个节点	ISRO、阿波罗远程医疗网络基金会（ATNF）
9	Fortis 医院	12 个节点	

尽管在国内多个邦开展了远程医疗应用项目，研发还没有同步发展到此种程度。到目前为止已开展和正在开展的研究项目总结在表 2 中。

表 2：研究项目摘要

	组织	项目标题	目标	资助机构
1	SGPGDMS[9]（1990 年 6 月）	极端环境下的远程医疗	Kailash Mansarovar 朝圣者的远程医疗保健	Kumaon Mandal Vikas, Nigam SGPGDMS
2	SGPGIMS（2001 年 1 月）	应用远程医疗技术在节日和灾难中提供电子卫生保健	节日和灾难情况下的远程卫生保健	DIT. Ministry of Communication & IT. Govt. of India
3	AIIMS SGPGIMS PGIMER C-DAC Mohali （2001 年 5 月）	开发远程医疗技术及其实施，以优化医疗资源	开发远程医疗软件（Mercury & Sanjeevani）	- Do -
4	SGPGIMS（2002 年）	开发移动远程医疗单元	用于偏远地区紧急情况和灾害管理的移动卫生保健	OTRI, Ahmedabad
5	SGPGIMS（2002 年）	开发可装在手提箱中的便携式远程医疗单元	紧急情况和灾害管理	OTRI
6	坎普尔印度技术学院（IIT）	开发便携式移动农村卫生保健模块（Sehat Sthi）	传播关于卫生和疾病的诊断信息以及治疗	Media Lab Asia
7	坎普尔 IIT	移动平台（Infothela）	设计用来装载诊断设备	- do -
8	坎普尔 IIT	用于说话受损和受大脑性瘫痪影响人群的增强交流系统（Sanyog）	自然语言句子发声器	- do -
9	坎普尔 IIT	嵌入式印度语文本朗读系统（Shruti）	为视觉存在问题的人群提供用于说明受损发声网络浏览器的交谈交流界面	- do -
10	新德里 AIIMS	IT 卫生系统在基层的可复制模型（Ca:sh）	PHCs & CHCs 数据的数字化更新。在手持设备上管理儿童患者	- do -
11	新德里 IIT	零配置无线网状网络（802.11b）	减灾 &管理	- do -
12	Byrraju 基金会	安得拉邦 84 个村庄的 32 个 Ashwinwi 中心	专家咨询卫生教育和宣传以及持续的医学教育	Byrraju.基金会

能力建设

阿波罗远程医疗网络基金与钦奈的安娜大学合作开办了为期 15 天的电子卫生技术培训课程，该课程综合了技术、医学和管理技能。勒克瑙的 SGPGIMS 与各邦和中央政府以及信息技术部合作开展了一项举措，在其校区设立了远程医疗和生物医药信息学院。这栋 2500 平方米的大楼将配有远程医疗、医院信息系统、生物医学信息、医学多媒体和影像管理、医学知识管理、人工智能、虚拟现实

和机器人技术等卫生领域的不同实验室。实验的目标是设立各种资源设施、结构性的培训计划、研发、为政府和私营卫生保健组织提供咨询、与印度国内和国外的技术和医学大学进行合作等。目前，SGPGIMS 正在向奥里萨、北安查尔和 Raibareli 远程医疗项目中涉及的人员提供远程医疗联网技术、管理方面和应用的培训。SGPGIMS 还向 DIT 提交了一个项目，支持建立实验室基础设施，在卫生 IT 领域开展各学科间的研究。该项目旨在在国家层面设立一个资源中心，吸引与卫生信息科学和技术有关的各学科研究人员，进行研究合作。该国家资源中心将在远程医疗和生物医学信息学院开展工作。

结论

印度的卫生保健提供商正在越来越熟悉远程医疗技术。一些邦已经开始采用，但绝大多数运用还处于项目模式。该项技术在保健交付系统中的普及还需要一些时间。在技术上，这个国家具备了所有用户需要的资源。带宽连接已经广泛普及且费用在迅速下降。除远程卫生保健以外，该项技术还用于远程教育且很快所有的医学院可能会连接起来，从而解决教师和医学图书馆设施不足的问题。绝大多数远程医疗项目都是医生推动的且其成功完全取决于人的因素，而不是技术因素。病人和卫生主管部门对该问题的认识是偏远地区将该新技术作为高质量卫生保健交付促进因素加以接受的关键。除制定收入模型并创建用于满足培训人员和开展研发需求的基础设施外有必要解决标准化、法律、理论和社会因素等政策问题。尽管启动项目取得了成功，还应该开发模型来长期支持该技术。

印度：准备实施移动电子远程医疗

印度正在开发两款性能卓越的设备 – 灾害管理系统“DISAMED 2000”和移动大篷车。两者皆为信息通信私立有限公司（OIPL）及其研究机构“在线远程医疗研究所（OTRI）”的工作成果。

灾害管理系统“DISAMED 2000”可帮助在边远地区部署医疗举措，从而在遭受诸如地震、洪水、台风、踩踏事故等自然灾害侵袭的场所提供迅捷的医疗援助和服务。此系统‘可拆解’，且可被设置为远程医疗工具包的形式，以将其携至仍使用马和骆驼等代步工具的人迹罕至之地，此系统亦可在出现严重灾害时空投至灾区，以便提供基本的医疗援助。（图 1）

图 1：

灾区 远程医疗灾害管理工具

自然灾害的侵袭没有任何预警，而洪水和地震堪称最糟糕的情况，因为在此类灾害初期几乎没有任何通信工具可言。由于患者和医生无法接触到彼此，问题的严重性亦随之加剧。在此情况下，“Disamed 2000”（一种灾害管理系统）对灾民而言可谓雪中送炭。“Disamed 2000”医疗手提袋是一种便携式防水、防震且可拉伸的工具包，可满足隔绝情况下的各种医疗要求。这些移动工具包可利用无线电波以视频会议的形式向控制中心传送医疗、研究和调查数据。目前，此系统已用于大规模集会和地震的救灾工作。

Disamed 2000 功能简洁且易于操作。此系统不需要任何技术或医疗专业人员来操作。信息/影像由灾害管理小区收集，然后传至灾害管理控制单元（DMCU），而利用收到的数据便可进行诊断/咨询。从 DMCU 到灾害管理小区的在线咨询功能令此系统成为应对灾情的最有效手段。

远程移动大篷车可在最短时间内抵达受灾地点，并提供尽可能多的服务。它可提供五脏俱全的医院设施，其功能如下表 1 所示。

表 1：

附件设施：	**可选附件：**	**通信媒体：**
1 麦克风	1 超声波	1 甚小口径终端（VSAT）
2 云台监控摄像机	2 回声多普勒	2 移动电话
3 L2 导联心电图（ECG）	3 肺功能测试	3 蓝牙
4 移动 X 射线机	4 脉搏血氧仪	4 国际海事卫星组织（INMARSAT）
5 暗室		
6 X 射线扫描仪		

移动医疗救灾大篷车

可工作于 VSAT、PSTN、ISDN、互联网、移动网/无线本地环路（WILL）、卫星电话，以利用实时视频会议传送医疗影像和数据。

传送实时超声波、血片、L2 导联心电图、X 射线、核磁共振、CT 扫描、实时视频/音频剪辑、导管室、实时视频/医学影像会议、血管造影、彩色多普勒超声。

与不同学科协作：放射学、心血管内科、儿科、产科、病理科、皮肤科、肿瘤外科、精神病科、眼科及其它各类学科。

OIPL 还设计并开发了一套农村远程医疗系统，以满足农村地区的医疗保健要求。此系统还提供教育（远程教育为此系统功能的一部分）和娱乐功能，并可将在世界各地的动态及时传至农户。

此系统将令教育系统发生颠覆性的变化，这对非洲贫国而言堪称一大福祉，而项目的低成本更是一大福音。同时，其采用的针对发达或发展中国家的高效手段令其得以‘超越’传统的、僵化的和无效的方法，而作为一种高效、以结果为导向且具有成本效益的方法来确保将医疗服务带至最底层的用户。

尼泊尔：国际电联在尼泊尔提供的电子医疗援助与未来规划问题

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引言

尼泊尔是一个以丘陵和山地地形为主的最不发达国家。它曾面临困难的经济形势，不过近期该国的政治局势已在推动其向一个公共民主经济体迈进。经济危机已导致政府的医疗和电信支出下降。目前，该国尚未出台远程医疗政策和医疗保险政策。

医疗推进工作由国家负责，相应监管部门为卫生和人口部（MOHP）。私营部门亦参与医疗服务的提供，但对老百姓而言医疗服务仍属奢侈开支。在政府层面尚未采纳任何远程医疗战略举措，但若干私营医疗机构和医疗从业人员已建立起一个远程医疗会诊网络。最近，国际电信联盟（ITU）协助尼泊尔编制了一份电子医疗总体规划，有关工作正在取得进展。

一般统计数字：尼泊尔是位于中国和印度两个大国之间的一个内陆国家。根据 2001 年的人口普查结果，其总人口为 256 659 599 人。位于喜马拉雅山麓的该国位于东经 80-88 度和北纬 26-30 度之间。国土总面积为 147 181 平方公里。尼泊尔主要分为三大地区：南部平原（17%）、中部丘陵地带（68%）和北部喜马拉雅山区（15%）。从行政区划上，尼泊尔被分为五大发展区，其中包含 75 个地区。首都为加德满都。

医疗统计数字：在上一财年（2005-06 年），基本医疗服务由 89 所医院、186 个初级医疗中心（PHCC）、697 个卫生站（HP）和 3 129 个二级卫生站（SHP）提供。初级医疗服务亦由 14 710 个初级医疗巡诊点（PHC/ORC）提供。医疗服务亦得到 48 164 名女性社区卫生志愿者（FCHV）的支持。

如上所述，政府拥有的医疗机构总数为 4 100 所，涵盖了全国 3 914 个乡村发展委员会（VDC）和 58 个市。卫生服务部的 25 377 名职员中有 60%以上在农村地区工作。在不同地区，共计聘用了 1 000 名医生和 4 199 名公共卫生职员。护理人员占总卫生从业人员的 20%。DOHS 分配给医疗项目的预算为 45.09 亿卢比（约 6 000 万美元），而卫生部门的总预算为 65.53 亿卢比（约 9 000 万美元）。外部发展合作伙伴的捐款占 DOHS 总预算的 44.9%。卫生服务部（DOHS）的年度报告显示：不同医疗项目提供的医疗服务具有较高的覆盖率，如逐年增加的心肺复苏术、安全孕产服务的普及和强化、门诊看病次数的减少、医院报告病例数量的减少等。不过，上述医疗中心仍发现了严重问题和缺陷，因此 MOHP 和 DOHS 必须共同采取适当行动来解决此类问题，以改进医疗系统的服务质量。

电信统计数字：截至 2006 年 4 月，电信业务提供商的数目为基础电话运营商（2 家）、蜂窝移动电话提供商（2 家）、农村电信业务提供商（1 家）、有限移动业务提供商（1 家）和提供电子邮件业务的互联网提供商（38 家）。

尼泊尔的老牌电信运营商尼泊尔 Doorsanchar 有限公司（NDCL，或简称“尼泊尔电信”）已推出扩容项目，涉及配线约 500 000 条（固定线路），总计约 120 万条，其中涉及移动、CDMA 和无线本地环路（WLL）电话。截至 2006 年 8 月，该公司已实现了约 4.64 的电话普及率。全数字化的网络可提供国内和国际直拨业务，国内干线网络实现了 1 762 Mbps 的速率，其中 788 Mbps 的宽带微波系统正在将加德满都和全国各地连为一体。为实现宽带连接，全国安装了约 1 250 条光纤 SDH E-1 链路。为连接农村地区，NDCL 采用了诸如数字 C-DOT、MARTS、VHF/UHF 无线电、数字微波、

高频（HF）无线电、VSAT 等技术。在农村服务普及率方面，已实现 50.4%的乡村发展委员会（VDC）至少配备一部卫星公用电话（PCO）。另一农村电信业务提供商“STM 电信”已获得独家许可，将为东部各 VDC 配备至少两条电话线。因此，VDC 的总普及率已达到 3 914 个 VDC 中的 2 387 个。

来自私营部门的基础电信运营商“联合电信有限公司（UTL）”共部署了约 45 000 部 WLL 话机及约 3 000 部有限移动话机。另一私营部门移动运营商“Spice 尼泊尔私营有限公司（SNPL）”的总用户普及率约为 110 000 条线路。

国家政策和电子医疗的重要性

医疗政策

尼泊尔于 1991 年通过了国家医疗政策，目的是改善人民的医疗水平。其主要目标为将基本医疗系统推广至农村地区，以令农民亦能受益于现代医疗设施和训练有素的医护人员提供的服务。该政策主要侧重于以下医疗服务领域：

- 预防保健服务（以减少婴儿和儿童死亡率）；
- 初级医疗服务（以促进全民健康）；
- 疾病防治服务（通过 PHCC、HP、SHP 和流动团队提供）；
- 基本医疗服务（通过各地区的各 VDC 和 HP 中的 SHP 提供）；
- 印度传统医学和其它传统医学服务；
- 组织和管理（以将地区医院合入卫生办公室）；
- 社区医疗服务（在各层面通过 FCHV、TBA 和本地主管部门提供）；
- 医疗人力资源的开发（加强培训和学术中心的建设）；
- 资源调动（如医疗保险、医疗费用、药品计划）；
- 与私营部门、非政府组织（NGO）和非卫生部门的协调；
- 权利下放和区域化（加强各 DHO 和 DPHO 的自治权）；
- 输血服务和供药（增加自产并改进质量）；
- 卫生研究。

同样，卫生和人口部亦制定了一项为期 20 年的“第二版长期卫生计划（SLTHP）”，此计划适用于 1997 至 2017 财年，旨在指导卫生部门的发展，以改善全民健康水平，特别是那些卫生需求尚不得满足的群体。它提供了制定有关战略、项目和行动计划的框架，并有助于在公共、私营、NGO 部门和发展合作伙伴之间建立起协调关系。

SLTHP 的主要目标如下：

- 将婴儿死亡率从每 1 000 名新生儿中的 64 人降至 34.4 人。
- 将人均寿命从 61.9 岁提高至 68.7 岁。
- 将每 1 000 个人中的粗出生率从 34 人降至 26.6 人。
- 将每 1 000 人中的粗死亡率从 10 人降至 6 人。
- 将避孕普及率从 39%提高至 58.2%。
- 将基本医疗服务（EHCS）的覆盖率从人口的 70%提高至 90%，且居民应可在 30 分钟内抵达医疗设施。
- 将总卫生开支占政府总开支的比例提升至 10%。

政府已将以下临床及医疗服务确定为重点的基本医疗服务（EHCS）：

- 对常见病和伤情的适当治疗。
- 生殖健康、安全套推广及发放。
- 扩大免疫规划（EPI）和乙肝疫苗。
- 麻风病和结核病的控制。
- 儿童疾病的综合管理（急性呼吸道感染、蛋白质能量营养不良、麻疹等）。
- 学校卫生、心理卫生与职业健康。
- 应急准备和管理。

此外，政府还开展了国家卫生部门计划（NHSP-IP）活动，此活动包含两项内容，侧重点在于绩效成果和以一种全部门方法（SWAp）实施的卫生政策改革，即 a) 强化服务的交付，以及 b) 机构能力和管理的发展。同时，尼泊尔政府亦通过了《千年宣言》，并致力于实现“千年发展目标”（MDG）。该国的第十个五年计划（2002-2007 年）已将 MDG 纳入其战略框架，并强调了改进监控机制的重要性。在 18 项不同目标中，扩大与私营部门的合作是首要目标，以期令新技术的福祉（特别是信息通信技术（ICT））惠及大众。

尼泊尔政府亦已启动旨在开发 ICT 基础设施及在全国推广 ICT 应用的新举措。多用途电信中心（MCT）得以兴建，以期为城市和农村人口提供通信技术，并着重为弱势群体提供计算机、互联网和电子邮件技术设施。目前，全国已有 21 个电信中心投入运行，其具体目标包括访问并传播农业信息、远程教育、远程医疗、促进经济活动的高效化及创造就业机会等。政府已与环境、科学和技术部（MOEST）和信息技术高级委员会（HLCIT）携手启动了电子政务举措。远程医疗旨在利用信息通信技术为远程用户提供医疗服务，并可用于调查、监测和管理病人与工作人员，为此需采用能够随时访问专家建议和病患信息的系统。在尼泊尔，远程医疗的用武之地体现在远程医学教育、远程医疗保健（如远程问诊、远程跟踪、转诊前筛选和远程辅导）和出现灾情时的远程医疗等领域。尼泊尔政府确定的基本医疗服务包括生殖保健、免疫、儿童疾病综合管理和学校卫生服务等，这些均可通过远程医疗来实现。

结合尼泊尔的情况，可以发现在城乡之间在医疗质量和使用水平方面存在着巨大差异。尼泊尔几乎 80%的人口生活在农村地区，而富有讽刺意味的是，大多数医生和训练有素的医务人员和技术人员却生活在城市地区。对尼泊尔这样的多山国家而言，交通设施是能否抵达最近的医疗中心的主要障碍，通常病人需要花 3 天左右才能步行到区级医院。如此看来，远程医疗就变得至关重要了。它可以省却旅行时间、旅行成本、对病人家属的负担及相关家务工作。在此方面，远程医疗的确可以有助于克服地理、时间、社会和文化方面的壁垒。

国际电联为尼泊尔提供的援助

尼泊尔政府已意识到急需制定相关政策和计划，以实现电子医疗实践和远程教育的制度化。信息通信部（MOIC）和卫生与人口部已开始研究上述问题，并得到了外部发展合作伙伴的帮助。主管部门正在计划、设计并颁布电子医疗总体规划，以便在城乡结合部和农村地区通过现有电信基础设施的部署来提供高质量的医疗服务。为此，尼泊尔政府已请求国际电联提供相关援助，以制定详实的总体规划，并以此来指导战略和运作程序的建立，以期在尼泊尔建立起电子医疗网络。预计电子医疗规划将提交给相关政府机关来采取行动，并有可能在实施过程中用于其它相关规章的制定和修正。因此，国际电联派出了远程医疗项目 SGPGIMS 的节点官员 Saroj Kant Mishra 教授于 9 月 11-22 日到尼泊尔加德满都开展工作。按照国际电联和尼泊尔政府共同确定的职责范围，Mishra 博士与卫生、电信和信息技术、尼泊尔电信和医科大学等部门的资深政府官员会晤并进行了讨论。在其最后报告中，这位专家向尼泊尔政府建议设立一个关于电子医疗的国家任务组，以便将利益攸关各方纳入同一平台并制定具体政策和工作计划，从而将电子医疗融入医疗服务和教育系统。他还建议开展有关项目来验证某些设想，如通过无线电信媒体以及经由虚拟专用网的电子继续医学教育（e-CME）来实现农村医疗接入等。

未来的规划问题

在开展电子医疗活动方面，电子医疗总体规划堪称一个具有指导意义的里程碑式框架。它或会涉及不同问题，如政策的颁布、电子医疗法案的制定、现有医疗设施与电子医疗网络的整合、实施问题、在全国建立医院网络以改善及整合医院信息系统（HIS）以及扩展网络并与印度及国外的其它三级保健医院建立起联系的可能性等。与全国远程连接相关的基础设施开发以及在远程医疗设备方面充分利用本地/节点医院和转诊医院将是顺利实施此类举措时会涉及到的其它问题。

该专家建议：在处理上述问题时须成立一个国家任务组。该任务组的构成应包括利益攸关各方的成员，其中包括 MOHP、MOIC、尼泊尔电信管理局和信息技术高级委员会的官员以及尼泊尔电信、医疗与电信部门的私营公司和消费者社团的代表。此高级任务组须有权履行以下职责：

- 为尼泊尔确立电子医疗战略、计划和实施活动。
- 就针对开发远程医疗服务所采纳的政策规划和项目不断向政府提出建议。
- 评估网络连接状态，并建议政府作出必要安排，以利用最合适的基础电信业务为相关地区提供高速连接和设施。
- 确定在国内不同地区通过远程医疗提供的不同医疗服务的类型。
- 在各区确定将连至远程医疗网络的 PHC 或 SHP、地区医院以及一家大学附属中心医院（三级医院）。
- 在提供此类服务时确定战略和运作准则。
- 为建立此类网络进行成本计算并作出成本效益分析。
- 在初期须设计若干试验项目，在此前亦需评估可用的医疗和电信设施。
- 估计预算要求，必要时可寻找捐助机构，如 WHO、ITU、UNDP、APT、UNESCO、ADB 等。
- 根据尼泊尔现有的 ICT 基础设施和医疗需求为该国起草一份电子医疗网络全球愿景，并为逐步推出电子医疗服务确立任务的轻重缓急。
- 确定项目实施机构，并确定信息通信部（MOIC）、卫生部（MOH）、电信监管机构（NTA）、电信业务提供商等在项目实施过程中的作用。
- 为系统要求和远程医疗设备、软件、安全性等的标准化确立准则。
- 酌情组建独立的分委员会，以视专长的不同推动工作的迅速开展，如政策的制定、项目的实施和监控、预算控制、基础设施的开发、用户组、公众意识、人力资源开发和国内/国际协调委员会。

为开展试验项目，政府须根据国家任务组的建议立即在以下领域对数据库（HIS/MIS）做出评价、制定规范并着手进行开发工作。

- 宽带连接和通信媒体的提供。
- 视频会议设备、高端摄像机和高清晰显示设备的提供。
- 用户友好的应用程序和非专有的硬件/软件。
- 训练有素的医务工作者和技术人员。
- 公众对远程医疗适用性的了解情况。
- 医生和医务工作者对信息技术的通晓程度。

结论

自 1994 年布宜诺斯艾利斯世界电信发展大会（WTDC）直至上一届多哈 WTDC 以来，ITU-D 关于第 14-2 号课题的研究组一直在致力于研究发展中国家的需求，其中包括增强监管机构、电信运营商、捐助方和用户的意识，以帮助其更好地了解 ICT 在改善此类国家医疗水平和人民健康方面的作用。各方已普遍认可电子医疗方案和应用在医疗服务的交付方面发挥着非常重要的作用，在发展中国家尤其如此，因为此类国家通常存在着医生、护士和护理人员的严重短缺问题。

在像尼泊尔这样的最不发达国家，利用现有的 ICT 设施开展试验项目来推出操作简便且成本低廉的应用将有助于克服在执行此类任务时可能遇到的障碍，其中涉及专业及高质量的服务、有限的培训设施、有限的通信和交通机会、对传染病的监控以及继续医疗教育等。因此，该国的任务组未来将面临巨大挑战，但惟有如此，才能最大限度地利用国际电联的援助以及其它国际机构的慷慨捐助，以便在利用信息技术实现医疗服务方面大展宏图。

俄罗斯：新一代移动远程医疗综合设施为向边远地区的居民提供医疗服务创造了新机会

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引言

考虑到全球在改善人民生活质量方面的普遍渴望和采取的务实措施，当前各界对远程医疗的普遍关注便不难理解了。进入信息技术时代以后，医疗服务取得了显著进步，但与此同时，在之前一成不变的医疗机构中普遍存在却不易察觉的一些问题便凸现出来。首先，这涉及到确保向边远地区的居民及时提供医疗服务的问题。此类地区的多数医疗点基本上仅可提供最基本的医疗援助，但在急需高水平医生问诊时（如需要特定疾病的专家时），这些医疗点便束手无策了。此外，在有些地区（如极北部地区），目前仍生活着原住民群体，这些人仍秉持着游牧生活方式。不断迁徙的生活条件令这些群体事实上被排除在现代医疗援助之外。因此，这些地区的疾病发生率和死亡率可谓与日俱增，传染病亦不时出现，这不仅为俄罗斯其他地区带来了实实在在的威胁，对周边国家亦然。关于此类问题，在不同国家以及国际组织的层面上都曾有过相关探讨，《北方》政策框架更是对此问题进行过详细阐述。

这一问题对俄罗斯而言也无法回避。在相当多居民生活在农村或边远地区（含极北部地区）的情况下，保证向居民提供相当质量的医疗服务便成为一个相当棘手的问题。研究和生产联盟《国家远程医疗机构》曾在 2003 年试图解决此问题，并在推广信息通信技术和移动远程医疗装置（MTU）的基础上设计了远程医疗项目。此系统在俄罗斯乌拉尔联邦区的叶卡捷琳堡市和比尔姆地区曾进行了成功运行，其结果表明此系统不仅具备极其先进的功能，同时还具有经济高效的特点，这为进一步完善移动远程医疗装置综合设施（MTU）奠定了基础。

远程医疗系统结构的建设原则

在建设新的移动远程医疗综合设施时，以下原则被列为基础原则：

1 以数字形式接收关于病人的客观医疗信息的可能性（即使在使用非数字医疗设备时亦应如此）。

2 为远程问诊存储、浏览、处理和编制病例数据的可能性。

3 在最短时间内远程传送所收集并整理好的医疗数据的可能性。与专家远程讨论此类数据的可能性以及接收诊断结果的可能性。

所有 MTU 设施均可分为三大基本设施：医疗设施、远程医疗设施和通信设施。

医疗设施涉及：数字和非数字医疗诊断设备；针对各类临床病例开展诊断研究的设备；

远程医疗设施包括收集、处理和存储医疗数据的设备；整理数据并执行远程医疗会诊的设备；远程医疗会诊的注册设备和将设备与医疗人员交付病人的移动设施。

通信设施包括各种数据传输系统。在此基础上，可使用所分配的特定“远程医疗信道”组建企业网络或使用现有的数据交换网络（如互联网）。选择哪一信道传输医疗数据及信道容量的多少由远程医疗系统的任务来定义。

远程医疗系统的结构

国家远程医疗系统可组建为四级系统

首先，在地方级（农村、边远地区或人口密度较低的地区），在进行持续的人口医疗监控（预防性体检和基本医疗服务）时，可使用地方常备医疗机构所配备的远程医疗点，并与独立工作的移动临床诊断装置相连接。

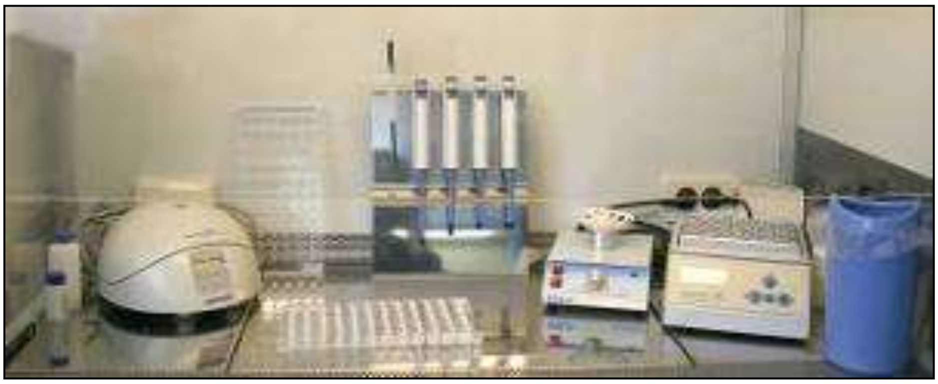
其次，在区域级，医疗机构的资深专家（须为区域性门诊中心的著名专家）为区医院的专家、医疗救助站和 MTU 人员提供远程医疗问诊服务，但这需要基于从 MTU 接收的数据。另一方面，区域远程医疗中心将连至联邦医疗机构，允许区域专家在碰到棘手病例时能够和高水平专家进行会诊。此外，系统亦可对病人进行定期监控，并从联邦中心获得医疗援助。

再次，国家级医疗机构可在遇到棘手病例时提供远程医疗会诊、对远程医疗部门的工作方法进行总体监督并对工作人员进行培训和教育。国家远程医疗中心还可根据手术资料对具体地区的病发水平进行控制。第四，国际级远程医疗诊断交流亦得以开展，在遇到棘手病例时，俄罗斯和国外的医疗专家之间可展开交流。需特别指出，在独联体国家，医生之间的交流颇为活跃，同时许多会讲俄语的医生曾在前苏联和俄罗斯学习过，这些人都希望与其导师和同事进行会诊。结合了常备远程医疗站和移动实验室的远程医疗系统在纵向和横向上均彼此关联，并可针对具体地区的情况做出调整，此外亦可根据地区规模、人口数和流行病发生的情况做出规模上的调整。

此系统的一大要素是移动远程医疗装置（MTU）。视医疗任务的不同，MTU 可与不同医疗和通信设备协作。根据各地的地理和气候特征，MTU 可安装在卡车车厢上、暴露于空气中或浮动载体上。因可与高级医疗机构的资深医生进行交流，MTU 的医疗工作人员由中等资质的专家组成即可，这在急需高水平医生时十分重要，而医疗服务的价格亦可大大下降，质量却丝毫不受影响。MTU 还配有生命支持系统和独立操作的设备。此类系统包括独立的柴油发电机、太阳能电池（用于南部地区）、用于非道路情况下作业的设备摊销系统、用于储存药品和食品的冰箱、卫星导航系统、卫生间、淋浴、脸盆架、医疗废罐、备用纯净水等。MTU 亦配备了全部通信设施，包括用于通过对地静止卫星收发医疗数据的卫星站。

MTU 工作人员所展开的医疗和其它检查结果以数字形式经由通信信道发至地方或区域级的常备远程医疗点，随后被转发至国内外的一流医疗机构。上述门诊的资深专家对此类信息加以分析，并将有关诊断结果和治疗建议通知 MTU 的工作人员。由"塔纳"集团开发的"托波尔"、"卡马"和"捷列克"等类型的 MTU 已在俄罗斯得到成功运行。MTU"托波尔"用于提供基本医疗援助及对居民进行常规和预防性体检，并可进行各种检查，其中包括胸部放射学研究、形态学和生化分析及功能诊断。此 MTU 的主要构件为低剂量数字 X 射线诊断装置（图 1）。

图 1：



MTU"卡马"用于对妇女进行预防性体检，并可进行各种检查，包括妇科调查、对乳腺的放射性研究（乳房造影）、形态和生化分析、功能诊断以及用于有效地大规模筛查妇科病的其它必要研究。MTU"卡马"的主要构件为数字乳房造影仪，它可用于乳腺癌的早期诊断。MTU"捷列克"用于传染性病原体的诊断：野生动物传染病（禽流感、钩端螺旋体病、兔热病、森林脑炎、蜱传疏螺旋体病等）和人体感染（脊髓灰质炎、甲肝、肚皮斑疹伤寒等）。诊断所采用的基本技术为实时模式下的聚合酶链反应（PCR）方法（实时 PCR）。该技术可对所研究材料中的病原体 DNA/RNA 进行定量定义、对所接收的结果进行登记和解释并剔除少数假阳性结果。MTU"捷列克"则可配备用于对相应病原微生物进行显示和鉴别的设备与材料。MTU 的主要构件为 PCR – 实验室。此外，针对相应急诊情况亦开发了用于结果清算的特殊类型的 MTU。

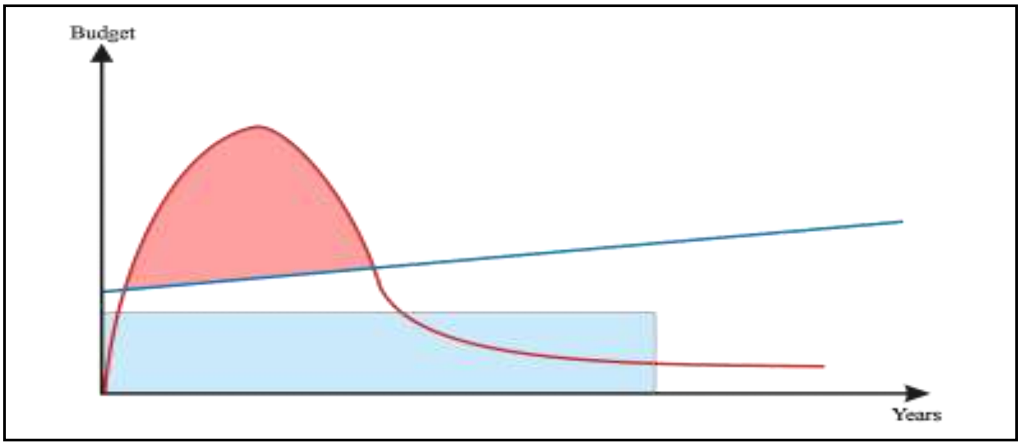
和地面通信系统相比，基于卫星通信技术做出的决定具有特定优势。此类决定实现了远程医疗网络的全球化，这要归功于对地静止通信卫星的使用，此类卫星覆盖着相当广阔的区域，甚至可包括一些邻国。此类决定的一大基本优势是卫星网络完全独立于区域性地面通信基础设施以外，而在特定地区则可能欠缺此类基础设施，或即便有此类设施也不符合现代技术的要求。鉴于上述情况，

为远程医疗目设立的电信中心可利用卫星 VSAT（甚小口径终端）系统。利用 VSAT 技术的另一好处是可缩短扩展移动远程医疗综合设施和卫星组网所需的时间。

对所建立的国家远程医疗系统进行经济高效的维护

在俄罗斯联邦的乌拉尔联邦区和比尔姆地区，就远程医疗系统已进行为期三年的成功运作，下图 2 为实验产生的系统经济指标。

图 2：



根据常备医疗机构系统的发展这一传统方法所作出的公共医疗预算随时间（深蓝色直线）的推移而增加。此外，在常备公共医疗系统中和若干情况下，因缺乏一定规模的预防性体检，病人在前往医疗机构就医时通常对自身的健康情况处于疏忽大意的状态，这将大大增加治疗和康复费用，而间接费用的数额亦不菲。为解决这一经济和社会问题，一个可行手段是对人口进行预防性体检。在此情况下，另一直线（红线）显示了公共医疗的收费情况。另一方面，对人口进行常规定期性体检的系统要求不断增加投资，如该图左侧的红线和深蓝线之间的红色《填充区域》所示。此类费用（通常较高）终归是过渡到大规模预防性体检的一大障碍。在部署远程医疗技术时，应对这一问题进行有效的经济决策。这在俄罗斯的《国家远程医疗机构》中已得到有效解决。如统计数字所示，由于对疾病进行了早期诊断，对人口进行定期预防性体检的治疗成本在早期治疗阶段亦相应地降低了。此方案之所以收效甚佳，正是由于使用了可节约资源的远程医疗技术来提供医疗服务，同时亦得益于此系统在提供大规模服务时的高吞吐量。以下为在俄罗斯联邦的乌拉尔联邦区和比尔姆区所开展的远程医疗系统实验的具体统计数字：

- 为农村人口提供了种类更为丰富的门诊和综合性医疗援助；
- 改进了流行病的防治形势，在结核病和艾滋病的防治方面尤为如此，这要归功于在早期病发阶段即已作出确诊；
- 将早期肿瘤的确诊率从 10%提升至 20%；
- 将暂时性残疾的发生率减少了 20%；
- 将死亡率降低了 5%。

和通过传统方法而不利用远程医疗技术获得同样结果相比，实现上述指标所对应的开支要明显小得多。

结论

远程医疗系统与移动技术的结合利用产生了相当丰硕的成果。目前，俄罗斯共建立了超过 15 所移动远程医疗综合设施，而在此领域的工作仍在继续进行中。

乌干达：乌干达移动电话技术的快速发展为以一种相对轻松、务实和经济高效的方式向数以百万计的居民发送有关艾滋病的消息提供了一个捷径

Hajo Van Beijma [1], *Bas Hoefman* [2], *Sentamu Phillip Sparks* [2]

乌干达利用移动电话对抗艾滋病的背景

尽管已做了大量工作，但在艾滋病、其它性传播感染（STI）和一般健康问题方面，乌干达的相关知识普及工作仍处于较低水平。虽然可以认为艾滋病对每个人而言都是耳熟能详，但仅有 30%的女性和 40%的男性对此有较为全面的了解（2006 年乌干达人口和健康调查，UDHS）。在乌干达，艾滋病的感染率为每天 370 人，每年 137 000 人，这可以说是相当惊人的。

移动电话技术在乌干达的迅速发展为以一种相对轻松、务实和经济高效的方式向数以百万计的居民发送有关艾滋病的消息提供了一个捷径，因此它是艾滋病防范和宣传普及工作的一项新工具。

在乌干达姆巴拉拉和整个非洲率先发起的“发短信以求变”项目旨在利用信息来提升公众对艾滋病的意识，为此需利用手机短信对公众进行小测验，以提升其对艾滋病的意识，并鼓励和动员参与者使用艾滋病咨询和监测（HCT）服务。短信平台可用于一般性的保健知识交流，也可用于发布免疫通知以及针对日后的规划工作展开调查。“发短信以求变（TTC）”是一家荷兰的机构，此机构致力于通过移动电话推动非洲的医疗教育工作。

本报告介绍了 2009 年 1 月 28 日至 2 月 28 日在 AIC 阿鲁阿办事处实施 TTC 项目时所开展的活动、采取的方法、取得的成就及遇到的挑战。

主要干预活动

AIC 阿鲁阿办事处得到了 AIC 总部的财政、后勤和技术支持，TTC 项目为取得成功采取了以下干预活动。

在筹备 TTC 项目时，首先在 AIC 总部的高层管理人员和 TTC 工作人员之间召开了磋商与规划会议，随后又在 TTC 工作人员和 AIC 阿鲁阿办事处的工作人员之间召开了类似会议。2008 年 12 月 7 日，Daniel Lukenge 先生（AIC 公关和宣传经理）和 Bas Hoefman 先生（TTC 阿姆斯特丹办事处主席）与办事处顾问委员会主席、阿鲁阿 BOT 代表以及 AIC 阿鲁阿办事处各部门主管和顾问就将姆巴拉拉的经验推广到阿鲁阿办事处问题召开了一次磋商会议。阿鲁阿工作人员获悉，TTC 项目将运行六周，目标受众为一万（10 000）名 MTN 用户，这些用户来自西尼罗河区，并由 AIC 阿鲁阿办事处作为 HCT 的服务的提供商。项目参与者将在其手机上接收到以多项选择题形式出现的交互式短信。如回答正确，参与者将自动获得免费的 HCT 服务，同时亦有资格参加每周的抽奖，奖品包括手机和免费通话时间。在会议期间，服务提供商就将使用的数据工具进行了讨论，并根据西尼罗河和阿鲁阿地区的艾滋病问题针对小测验的形式和内容给出了具体建议。

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1 “发短信以求变”，荷兰。

2 “发短信以求变”，乌干达。

宣传

为促进公众对 TTC 项目的了解，在阿鲁阿镇的要塞共张贴了 100 多份海报和传单，同时 TTC 成员也向社区发放了相关资料。四家调频广播（即 radio Pacis 90.9 FM、Arua One 88.7 FM、Voice of life 100.9 FM 和 94.2 Nile FM）共插播了 60 次相关通知、介绍和消息。此举亦在为手机短信的宣传攻势投石问路，并将此项目与皮包公司向用户手机发送的垃圾短信类的促销项目区分开来。（有关电台专门时段宣传资料的内容见附录 1）。Radio Pacis 电台的一个谈话节目向听众介绍了 TTC 项目，并谈到了可能会阻碍此项目成功实施的潜在挑战。据估计，共有 500 万名听众收听了该节目。该谈话节目的负责人为办事处经理 Lumu Henry Leku、AIC BOT 成员 Hon Dick Nyai、BAC 主席 Opima Dan 先生与 Daniel Lukenge 先生（AIC 公关和宣传经理）以及 Bas Hoefman 先生（TTC 阿姆斯特丹办事处）。节目主持人为 Flexie。

结果

阿鲁阿和西尼罗河的一万（10 000）名 MTN 用户收到了有关艾滋病的短信，两千一百（2 100）人直接参与了艾滋病短信小测验。在项目期间，在办事处和西尼罗河区及周边地区的 HCT 服务点，使用 HCT 的人数大大增加。在 2009 年 1 月 28 日至 2 月 28 日期间，共有 677 人（含 376 名男性和 301 名女性）使用了 AIC 阿鲁阿办事处的 HCT。由于此项目的性质和所采用的干预手段的丰富性，这是在一个月内实现的受众面最广的服务活动。在活动中，共有 131 对夫妇（262 人）和 102 人在使用 HCT 服务之前即已发送了 TTC 短信（表 1）。这比同类活动的平均用户数增加了 33%。

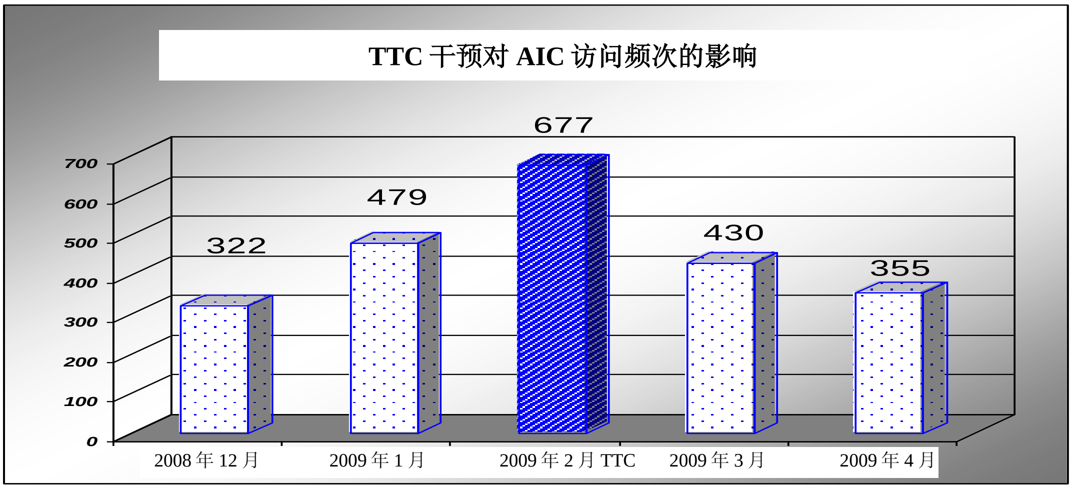
表 1：

结果概要：	
短信送达的用户数	10 000
参与小测验的人数	2100
使用 HCT 的人数	677（男性=376 人 女性=301 人）
接受服务的夫妇数：	131（262 人）

参加艾滋病小测验的优胜者获得了免费的通话时间和手机等奖品。获得手机奖品的优胜者受邀于 2009 年 2 月 27 日参加了在 AIC 阿鲁阿办事处举行的授奖仪式。参与仪式的有阿鲁阿办事处的工作人员以及 TTC 项目主席和办事处经理，办事处经理向优胜者发放了奖品。参与活动的还有本地广播电台的代表和英国广播公司（BBC）记者 Joshua Mali 先生。BBC 记者还采访了获奖者和 AIC 阿鲁阿课程考核俱乐部的成员。在阿鲁阿，关于艾滋病的对话由于收到小测验试题的用户与其亲友展开了交流而呈增加之势。对试题给出的不同答案又强化了正确答案的影响力。此项目强化了众人对艾滋病的意识，并敦促每个人去了解自身的健康状态。在阿鲁阿镇的大街上和公共场合对此展开的公开讨论便证明了这一点，原因是人们需要使用手机来收到正确答案，然后还要与亲友交流相关答案。此项目向一万多乌干达人发送了有关艾滋病的短信，并向其介绍了在该地区应去何处使用 HCT 服务方面的信息，其中包括关于向难以通达的居民提供相关服务的信息。许多艾滋病学者和合作伙伴在听了 BBC 的节目后，都不禁为这一富有创新性的防艾手段击节叫好。

“此项目让我和我全家了解到更多关于艾滋病的知识，因为每次我收到短信，我都会给我的孩子打电话，让他们帮我看短信并将其翻译成卢格巴拉语，这样我便能找到正确答案并获得奖品了。我很高兴我最终能赢得相当于 10 000 先令的免费通话时间，同时我也到古卢瓦医院了解到我的艾滋病感染状态。”（古卢瓦医院一名门卫的获奖感言）

“在收到“发短信以求变”项目的短信前，我一直没想好是否去做 HIV 检测。所有的短信都鼓励我在 AIC 阿鲁阿办事处进行 HIV 检测。现在了解了自己的 HIV 状态，我决定对自己的生活方式加以控制”。阿鲁阿办事处的一位顾客在测试出 HIV 阴性后这样提及她的减少风险计划。



2008 年姆巴拉拉的实验研究

从 2008 年 2 月 14 日至 2008 年 4 月 8 日，在大姆巴拉拉地区共有 15 000 名扎因公司的移动电话用户参与了相关的实验研究。该项目共持续了 8 周。

共有 2 610（17.4%）人至少回答了一个短信问题。有 807/2610（30.9%）人透露了自己的年龄。平均年龄（95%的信赖区间）为 29.2（28.5-29.8）岁。年龄的中位数为 26.0 岁。在已知性别的 801 名受访者中，567（70.8%）人为男性，234（29.2%）人为女性。回复率在小测验的第一阶段曾出现下降，随后便稳定下来。答对率最高的是第三个问题（“艾滋病毒的载体为 a) 精液；b) 汗液；或 c) 血液”），而第 11 个问题（“艾滋病检测是否精确？”）的答对率最低。关于快速检测的问题有 317 人（关于此问题的受访者的 95.8%）答对；关于‘窗口期’的问题有 142 人（关于此问题的受访者的 80.7%）答对。关于是否会让其他人知道其检测结果的问题，33.8%的人表示‘会’（118 人），关于检测是否准确的问题，99.3%（138 人）回答为否。在 AIC 姆巴拉拉，有 255 人因我们的节目去做了自愿咨询检测（VCT）。在这些人中，71.7%为男性（183 人），28.3%为女性（72 人）。在通过 TTC 项目进行检测的人中，艾滋病的患病率为 7%，这比乌干达西南部地区的患病率（5.9%）略高一些。

未来

通过与联合国经济和社会事务部（联合国经社部，UN-DESA）就“texting4health”举措展开合作，TTC 项目将于 2009 年 7 月在乌干达金贾地区发集居民参与一项为期 10 天的保健小测验，为此将使用短信来作为此公共健康宣传活动的载体。此活动主要关注疟疾、艾滋病和儿童健康。此短期 TTC 活动的目标为：

1 提请公众注意移动医疗的潜力。

2 通过展示实时收集信息的可能性增进公众的意识和兴趣。

3 展示通过移动电话通达民众的便捷性所在。

上述展示活动的结果将在于 2009 年 7 月在日内瓦召开的联合国经济与社会理事会（经社理事会）的年度部长会议上与联合国成员国代表进行交流。

TTC 项目得到了乌干达卫生部、联合国和世界卫生组织（WHO）的大力支持，上述机构均认为此项目为一项极富创新性的举措。

由美国国际发展署（USAID）支持的针对私营部门的健康举措（HIPS）正在试图在现有的行为改变交流（BCC）方法和干预活动中加强男性割礼（MMC）和多性伴（MSP）的一体化进程。为确定此一体化进程的最佳机制并评估 BCC 的结果，有必要在目标受众之间就知识水平、态度方向和实践水平确立当前的经验证据。为此，HIPS 和 TTC 合作在三家公司的 300 名男性和女性员工中开展了一项基准研究，这三家公司分别为：金贾的 Kakira Sugar Works、马辛迪的 Kinyara Sugar Works 和卡塞塞的 Kasese Cobalt 有限公司。为补充和确认所收到的短信数据，HIPS BCC 的工作人员和朋辈教育培训人员将利用各类途径展开六个专题小组讨论（FDGS），其中包括健康博览会、社区视频节目、只限男性参加的研讨会和朋辈教育培训等。

所取得的经验

- TTC 项目是可行的。许多乌干达人在收到邀请参加艾滋病毒监测的短信后都觉得自身受到了关注。
- 在 HCT 方面仍有大量需求未得到满足。
- 用短信可在短时间内以低成本通达较多人。
- 项目在传达讯息时不存在失真，并使对抗如艾滋病一类的性病和其它传染病的活动更具可参与性和可持续性，因为短信可存储较长时间，并可通过不时翻看加深印象。
- 该项目在增进人们对艾滋病的了解方面有着长远影响，它消除了围绕着艾滋病的神秘感、误解和禁忌，并刺激着对艾滋病防治服务的需求。

- 该项目需辅之以其它媒体手段，如电台广播、广播主持人（DJ）的介绍、海报、现身说法、专题小组讨论以及那些已充分享受到服务甜头的用户的经验。不断发短信提醒用户也迫使用户去做检测。

建议

- 在项目实施前和实施中需进行足量宣传，并利用适当的媒体工具。因资源有限，利用电台的专门时段进行宣传每周只能做到一次。
- 需要针对所有移动网络。
- 以大多数本地语言编制和印刷有关此项目的信息 – 教育 – 交流（IEC）材料，其中包括短信。
- 需要对所发的短信进行足量的预测试。

Annexes

Annex 1

Armenia: Development of eHealth Master Plan

Background

Major progress in the field of Information and Communication Technologies (ICT), including wider availability of telecommunications, modern videoconferencing equipment, software developments and multiple Internet-based solutions, opens completely new opportunities in the provision of healthcare. That, together with a need to organize more effectively delivery of health services, in terms of time and distance, and to contain health care costs, resulted in recent decade in a sharp increase in the use of ICT applications in health care, collectively known as eHealth. "eHealth is the use, in the health sector, of digital data – transmitted, stored and retrieved electronically – in support of health care, both at the local site and at a distance." Major international structures (such as the United Nations, European Commission, World Health Organization, and International Telecommunications Union) have officially prioritized development and wider use of eHealth applications and services. E.g., the World Health Assembly's eHealth Resolution of 2005 (WHA58/28) underscored WHO's commitment to advancing eHealth and recommended to all member states "to consider drawing up a long-term strategic plan for developing and implementing eHealth services in the various areas of health sector".

The introduction of eHealth applications requires multidisciplinary collaboration, with active participation of ICT and healthcare professionals.

Armenia was one of the most industrialized republics of the former Soviet Union with a sophisticated high technology sector. Nowadays ICT domain is one of the most successful and fastest growing industries in Armenia. During the last 10 years, the ICT industry saw a sharp increase in the number of newly formed companies, both local start-ups and branches of foreign companies. More than 90% of the foreign companies were established in 1998-2008. The number of operating IT companies in 2008 reached 175 representing nearly 17% growth from 1998 to 2008. On average 17 IT businesses were launched annually in 2000-2008. This is in sharp contrast to 1990s when only 5 companies were formed each year. In 2008, Armenian ICT sector generated around $111 million ($38 million in 2003), which constitutes around 1.2% of GDP.

However, penetration of ICT applications in health care sector remains remarkably low, which reflects absence of national strategy and sustained policy in eHealth. The vast majority of country's 140 secondary care institutions and almost all primary care facilities do not have sustainable access to high-speed Internet, as well as other modern telecommunication routes. Even major multi-disciplinary tertiary care institutions in the capital of Armenia, city of Yerevan, are lacking necessary IT equipment and communications. Major eHealth tools, such as electronic Hospital Information Systems, Electronic Health Records, Picture Archiving and Communication Systems, e-prescription and e-referral, are not installed. Local web-based activities are as yet sporadic, so those health specialists (and lay public alike) regularly using on-line health related resources rely heavily on access to international health information portals.

eHealth Master Plan will allow coordinated efforts by all interested parties in developing and implementing mentioned eHealth applications in Armenia. That will ultimately benefit all interested parties:

- Patients (in terms of universal equitable access to quality care and cost reduction);
- Health care professionals (in terms of productivity, competencies);
- Community (in terms of public health efficiency and cost containment).

The purpose of the project

It is to develop a long-term strategic plan for developing and implementing eHealth services in various areas of health sector (eHealth Master Plan). This will include the following aspects:

- Detailed analysis of the current state of healthcare sector in the country;
- Research of international experience in eHealth development;
- Define the role of telecommunication and information technologies in supporting healthcare;
- Find country specific aspects in health policies; define how eHealth will influence existing medical practice, education and research in Armenia;
- Social-economic evaluation of eHealth project for the country;
- Define national eHealth priorities, strategies and roadmaps for coming 5-10 years;
- Define relationship between national healthcare reforms and eHealth;
- Define eHealth services in the various areas of health sector. Propose list of possible eHealth services based on existing telecommunication infrastructure for main hospitals;
- Propose model structure of Hospital Information System (HIS);
- Determine provisional cost of the installation of eHealth infrastructure in one hospital as a model; draw eHealth business plan for one hospital as a model;
- Prepare budget for each stage of development;
- Define national strategy for eHealth – National Program for eHealth, example: "eHealth Foundation Armenia";
- Define the stakeholders and those responsible and authorized for deployment of eHealth infrastructure and components;
- Find optimal balance between legislative measures, consensus based decisions and selection of pilot cases supported by believers;
- Propose structure of national telemedicine network;
- Propose network structure for the capital – Yerevan city;
- Propose list of eHealth services for the region;
- Define national standards for: Core data set, Demographic Data, Health profile, Insurance plans;
- Define national standards for: Authorization, Authentication, and Privacy;
- Define national standards for: minimal functional and data requirements of IT solutions for providers (hospitals, primary care doctors,...);
- Instead of revising current resource allocation to national institutions such as MOH, health insurance, medical universities and schools, consider creation of an agency (or institution) with relevant name like Electronic Health Center.

Participants

Armenian Association of Telemedicine (AATM):

AATM is a non-governmental, non-profit organization founded in December 2008 having the ***mission*** to bring the health ICT field in Armenia to existing international standards, while at the same time participating in further evolution, expansion and progress in the field worldwide.

The ***major goal of AATM*** is to assist in increasing quality and accessibility of health care in Armenia via exploration, establishment and development of various health ICT applications and services in the local health care system.

Main Objectives / Directions of Activities are the following:

- Centralized coordination and support for Telemedicine and eHealth activities in Armenia;

- Cooperation between various institutions and Telemedicine services providers locally;
- Cooperation with major international associations, agencies and industry groups in the field;
- Development of educational activities and assisting in staff management;
- Cooperation with central and local governmental structures; working in legislature area;
- Expansion and further development of the Association.

AATM has by now completed the following tasks:

- Defined structure of the organization, general vision and strategy of development;
- Established contacts and developed agreement on partnership with leading local ICT structures and companies (UITE, Nork IAC, Microsoft RA, Synopsis, Sourcio, D-Link, Macadamian RA, among others);
- Established contacts with leading international structures in the field (World Health Organization, International Telecommunication Union, International Society for Telemedicine and eHealth, American Telemedicine Association, European Health Telematics Association, among others);
- Applied for and obtained status of National Member of ISfTeH from Armenia;
- Held consultations and established cooperation with leading specialists in the field related to forthcoming projects.

Macadamian AR CJSC:

Founded in 1997 "Macadamian Technologies" headquartering in Canada provides a complete range of user experience design and software development services to clients throughout North America, including Ottawa, Toronto, Montreal, Boston, Dallas and San Jose. In 2007, "Macadamian Technologies" opened a subsidiary called "Macadamian AR" in Armenia. Armenia branch has grown up to 35 people in one year, inheriting processes and expertises of the Canadian headquarter.

Macadamian has worked with a number of medical device and healthcare companies to develop the control and measurement software for mass spectrometers, build single-sign-on software for hospitals, and develop patient-nurse collaboration systems for remote healthcare. Some of our work has included:

- Designing and developing a web-based software application that controls and collects data from a sleep monitoring device;
- Improving the instrumentation control system of a mass spectrometer, using National Instruments' LabVIEW instrumentation software;
- Designing a telehealth application interface easy enough for senior citizens to use;
- Conducting a usability requirements and re-design project for a simple, mail-able DNA collection device.

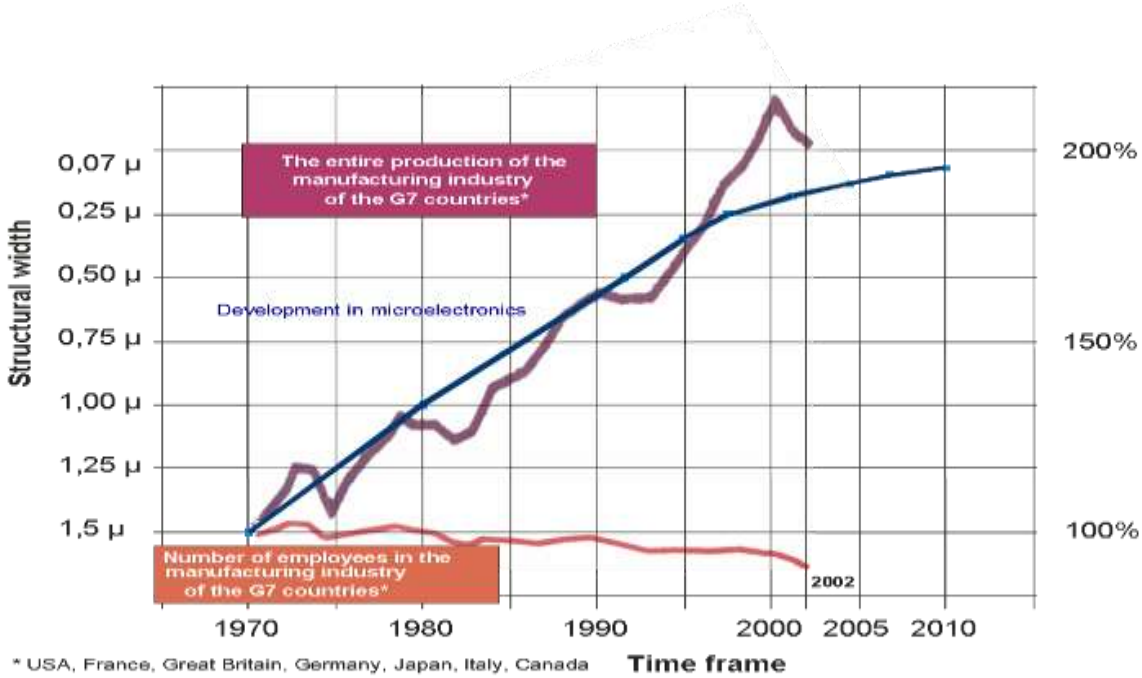
Annex 2

Germany: Ambient Medicine® - Telematic Medical Systems for Individualized and Personalized Assistance

P. Friedrich [1], J. Clauss [2], A. Scholz [3], B. Wolf [1,4]

Mobility and information technology have become normal part of our lives and have emancipated the average citizen in the process. The best example is the pervasive use of the mobile phone. The areas of health care and consumer protection, however, are still lagging far behind as a survey conducted by the VDE (Association for Electrical, Electronic & Information Technologies) recently showed [1]. 77% of the German population stated that in their opinion much more needs to be done in medical technology. More than half said they were interested in telemedicine. Lying dormant in the clever combination of modern sensors and modern information and communication technologies, which have demonstrated enormous efficiency potential in the rest of the technical world, are also considerable cost savings and quality potential in the field of medicine. This relationship is shown in figure 1.

Figure 1: Efficiency potential due to the development in microelectronics



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For this reason, a number of years ago we started to develop sensor-based strategies, which permit realization of individualized and personalized diagnosis and therapy concepts combined with telematically oriented data bases to complement our developments in medical sensor concepts [2,3,4]. If, for example, the high hopes placed in the health card will ever be fulfilled also depends on the proper anamnesis and protocoling of the respective, treating physician. In view of standard office procedures, it is doubtful if this will ever really be the case in doctors' practices because for various reasons billing data and treatment data do not have to be identical.

Moreover, it has been proven that measurements carried out by the patients themselves in their home or their work environment is essentially more authentic and provides more reliable data [5]. Individualized and personalized sensor-based diagnosis can provide realistic imaging of many symptoms and even be developed to such an extent that the patient can be helped directly via evidence-based and personalized data base structures. Already today medical care in rural regions is not immediately ensured at all times. Here telematic diagnosis and therapy systems can be of great assistance and can permit organizing more efficient treatment structures. In many cases, it suffices the patient to receive advice on how to behave based on acute data which will allow the patient to cope adequately with feeling unwell. This information can also be provided by health care providers which have the necessary patient data at disposal and, if need be, can have a long-term care relationship with the patient.

The most important criteria for acute unwellness are immediate access to medical knowledge and the corresponding advice. In order for the physician who is not on site to be able to judge the situation, he needs reliable basic data, such as for example heart rate, blood pressure, temperature, weight or metabolic values such as for example glucose and, if need be, seeing the patient. It also makes economic sense to use sensor-based telematic systems to allow the continuously aging population to age “healthily” [6]. The systems can ensure regular intake of medication or on a need-by-need basis as well as concrete changes in behavior.

In the following, the results from many years of working on developing such systems are described including the possible risks linked with their use and first attempts at telematic therapy concepts.

General Observations on Telemonitoring

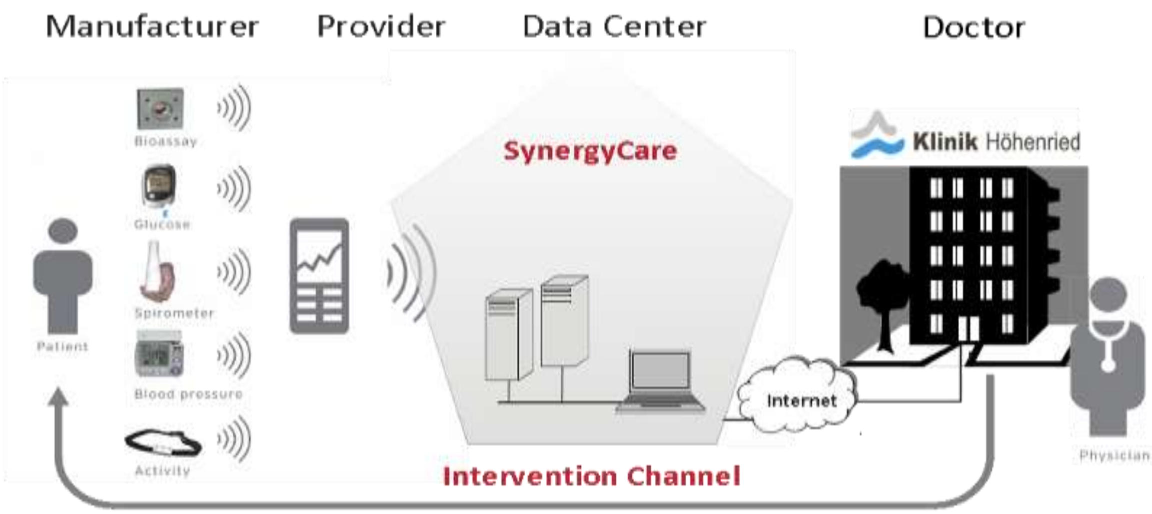
Telemonitoring or home monitoring is a modern component of the care of chronically ill patients which takes into account the entire treatment of the patient from prevention to diagnosis and therapy to rehabilitation. The fundamental idea is to bridge the spatial gap between the patient and the treating doctor for a certain period to prevent a care gap from occurring. This care concept should not be confined only to the chronically ill, but also presents an ideal aid for all health-conscious people, especially for the aging population.

At the beginning, such a system was intended for extreme situations in which patients or the to-be-observed person, for example members of an exhibition or military staff located at some distance from any medical institution. Meanwhile, this is the case for many parts of the population simply due to the increasing sparsity of doctors in many regions of Germany. The purpose of such telematic medical systems is to record using sensor-based aids the health-relevant data about the condition of a person under observation and to transmit this data to a counterpart, where specialists study it.

With time the single specific solutions became a complete platform, the telemetric personal health monitoring system. Its setup is shown in figure 2. The name “TPHM” came from, on the one hand, from personalization of medical devices, and, on the other hand, from telemetric transmission of medical relevant parameters.

Due to technical developments and the consequent cost reduction in manufacturing small and thus mobile medical measuring devices, for some years it has been possible to also take up a large number of patients with a variety of ailments in a telemonitoring system. One such “target” group may be patients who need to consult a doctor frequently just to determine a physiological parameter, such as for example blood pressure or blood sugar concentration.

Figure 2: The Ambient Medicine® platform with the data base connection SynergyCare



Telemedical technology is used as a central component that combined with easily accessible and widespread communication networks permits providing care for patients mobily – i.e. independent of where they are. The patients measure their indication-based values regularly themselves to obtain information about their momentary condition. Upon request or if treatment is necessary, this information can automatically be conveyed to the treating doctor.

This type of time and place independent treatment corresponds to the increasing trend toward mobility and pressure to reduce costs in health care. Implementing a telemonitoring system allows realization of not only financial but also medical advantages for the patient. Continuous observation of the patient permits detecting changes in disease dynamics quicker and, in particular, detecting deterioration early and in the best case ward it off. In many cases, a patient's quality of life is improved.

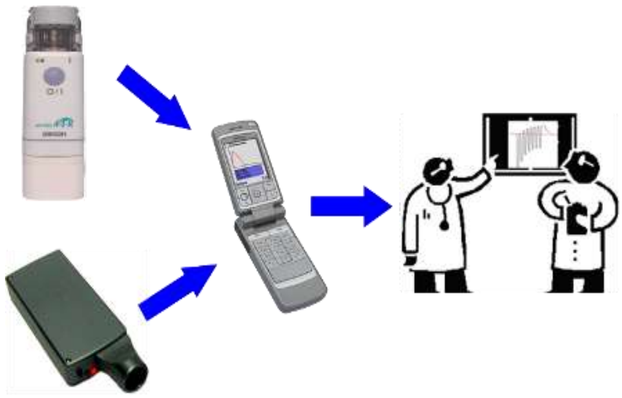
The sensor-based telematic solutions described here are an extension of the TPHM system with technical devices. Here, telemedical care is based on integration of a mobile phone as an interface between the patient's measuring device and the treating doctor's server. Owing to the omnipresence of mobile phones in general today and to those with bluetooth technology in particular, the user usually does not need to purchase additional devices. The respective medical devices have been extended by a bluetooth-transmission and reception module or if need be one newly developed by us. An essential feature is simple operation of the measuring devices and the mobile phones. Our solutions require no action on the patient's part to transmit the measured data. Transmission via email or data SMS by the mobile phone is triggered automatically after successful measurement.

Examples of Realized Electronic Assistance Systems for Selected Indications

Respiratory Disorders

Chronic respiratory disorders are among the most widespread common disorders. The most frequent indications are asthma and chronic obstructive pulmonary disease (COPD) and strike approximately 150 million people, tendency rising. Observation, respectively monitoring afflicted patients is a decisive factor in medical treatment. The well-being of a patient relating to his/her respiratory disorder is determined by a spirometer which measures the lung-function values. However, to assess the course of the treatment requires protocoling additional therapeutic measures. The time point of medicine intake, of pollen warnings in various regions and the outdoor weather conditions may decisively influence the success of a treatment. The relationship between weather conditions and the frequency of asthma attacks and allergy attacks has been proven in a scientific study [7]. Home Monitoring which enables observing a patient in his daily surroundings has attracted much attention. These systems must be comfortable and easy to use, in addition small and handy [8]. For this purpose, we developed the first telemedical spirometer for measuring lung function parameters and extended it into a mobile, patient-based diagnostic and therapy system [9]. A conventional spirometer equipped with a bluetooth communication unit automatically transmits the values determined by the peak-flow measurement to a corresponding mobile phone which then conveys the data to the central data base. In order to make best possible medical use, the spirometer is combined with an inhaler, figure 3. Thus lung-function values and medication intake are documented and observed simultaneously. These data permit drawing conclusions on the effectiveness and the dosage of the given medication and responding with immediate corrective measures. Such a medical assistance system can also be used to observe patient compliance. As a result of this feedback, the mobile measuring devices are also at disposal for individualized motivation and training measures, promoting in this way active patient involvement in the therapy process and thus increasing patient responsibility.

Figure 3: Combination of spirometer and inhaler



Cardiovascular Diseases

Half of all deaths in Germany are caused by cardiovascular disorders. One of the main risk factors of cardiovascular diseases is arterial hypertonia. About 40% of the German population has high blood pressure. Compared to the role that high blood pressure plays in causing fatal “heart attacks”, the extent it finds treatment in Germany is still negligible. Moreover, single blood-pressure measurements do not always provide reliable information: blood pressure is subject to natural fluctuations during the course of the day. Physical examinations in the doctor's office or in the hospital may falsify results, because stress causes the blood pressure to raise – a phenomenon known as the “white-coat effect”. An effective way to avoid this effect is regular self-measurement of the blood pressure using a system like the one shown in figure 4. To record the measured values, we use conventional blood-pressure-measuring devices. These measuring devices are equipped with a bluetooth interface via which the detected blood-pressure values are transmitted to an allocated mobile phone. Software is installed on this mobile phone which packages the received measured values in an email and stores them in a mail server. From there, the measured values can be retrieved at any time and further processed. This occurs via a data base which provides statistical processing in addition to graphic representation.

Figure 4: Telemedical, mobile blood-pressure-measuring system of the Heinz Nixdorf-Lehrstuhl für Medizinische Elektronik in cooperation with Sendsor GmbH

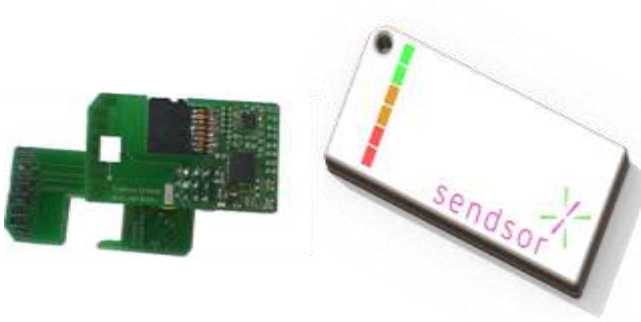
In such a personalized therapy, patient compliance is much better than is the case with conventional methods of treatment. Apart from the growing frequency of hypertonia, there are an increasing number of other diseases among them diabetes mellitus or adiposity that demand reliable and intensive care. If these three disorders occur in combination with a fat metabolism disorder, it is called a metabolic syndrome, which increases the risk of cardiovascular disease further. The Ambient Medicine® platform developed by us offers an ideal basis for monitoring the parameters linked with these diseases. Consequently, we extended it with devices such as weighing scales, blood-sugar and ECG measuring devices for such telemetric use. Figure 5 shows as an example the ECG open.

Figure 5: Mobile ECG measuring device cpen of the Telmed Medizintechnik GmbH [10]

Activity Monitoring

In most cases of feeling unwell and the previously mentioned typical symptoms, suited moderate corporal activity plays a significant role in recovery. Consequently, recording patient-specific physical activity data is gaining in importance. Defined training programs can help patients reach their goals. An activity monitor for self-monitoring may be helpful. A high-resolution activity sensor worn by a patient on a key chain, on a chain around the neck or as a band around the arm or leg measures the continuous acceleration and/or the inclined profile of a patient. The data are sent (e.g. one a day, incident-based) to a medical center. The activity values are compared there with other disease-relevant values. The activity sensor comprises a threedimensional acceleration sensor, an internal storage (microSD card) for the gathered data, a battery for portable use, a display to allow self-monitoring and a SD-card-compatible interface for simple, convenient readout of the data on a PC by the physician, figure 6. In addition to this, in the device software is installed, which upon insertion of the device into the card reader (SD-card-compatible interface of the device) starts automatically, evaluates the stored physical activity profile of the patient on the PC and shows it at a glance. This simplifies analysis and how to proceed in the therapy for the physician. Activity monitoring should be a component in overall home therapy. It makes no difference whether the data are transmitted telemedically via a "telemetric personal health monitoring system" or whether the physician reads the data from the activity monitor whenever the patient comes to the office.

Figure 6: Miniaturized activity sensor for a vest pocket developed by Sendsor GmbH



The overall system is a small desktop station or a portable handset. It can also gather process and transmit additional data, for example, from a spirometer or a blood-pressure measuring device. The station's complete set of parameters is written on the memory card of the activity monitor and is immediately transmitted to the treating physician via available telecommunication channels permitting subsequent evaluation of the data as well as immediate intervention by the physician. Furthermore, the patient is advised to keep a diary to compare the measured values online or later with the current state.

Virtual Lab

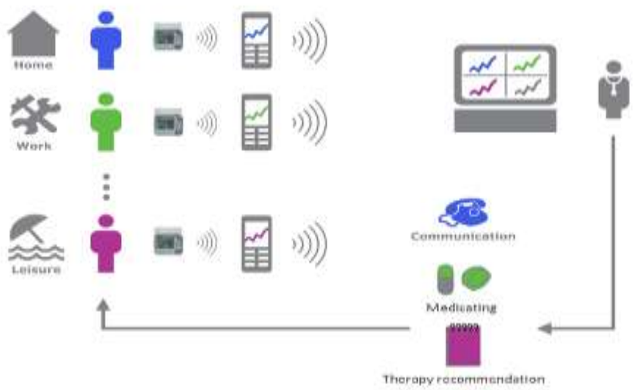
The virtual telemedical laboratory presented here, also called virtual lab, and offers a solution that meets the requirements of both the increased mobility of a patient and of the medical staff as well as the increasing expectations of ubiquitous and best possible prevention and therapy. Set up and operation correspond to the previously expounded principles.

Particularly in the case of diseases with a patient-specific cause or patient-influenced diseases it is indispensable to obtain as authentic as possible parameters that record both the current situation in the patient's routine day as well as document the course of a disease over a longer period of time. This means that the patient measures himself in his accustomed surroundings. He can do this at home, at the work, on the way or anywhere and everywhere a current, individual vital parameter is always being recorded. A further advantage, apart from being location-independent, the patient can measure at own-selected times or at times prescribed by medical specialists. Automatic transmission of the measured values to a data base ensures uninterrupted recording, which is indispensable for individual and personalized therapy. Besides being able to determine just the course of the measured values, which alone already document improvement or deterioration of the patient's health, highly individual conditions can be detected.

Data base

A data base accessible via the internet at any time for respective authentication was implemented to store data independent of place and doctor. Both the patient and medical staff can enter this data base as registered users with certain user rights and read these self-measured and graphically processed values on a display. For patients, it offers active involvement in the course of their disease or therapy, for doctors it offers simple and inexpensive support in their intensive care of their numerous patients. Depending on the indications, patient-specific borderline values that can be set and if exceeded or fallen below trigger definable actions such as calling or informing the patient or the doctor. In a next step, the data base is extended to an evidence-based specialist system, which can give in consultation with the doctor medication or therapy advices. Figure 7 shows the already realized virtual lab.

Figure 7: Overview of the virtual lab system from the Heinz Nixdorf-Lehrstuhl für Medizinische Elektronik of the Technical University Munich



Feedback and Intervention

Medical assistance systems are of great significance in particular in long-term monitoring both in primary and in secondary prevention. In order to prevent artefacts, measurements should be carried out regularly in the accustomed surroundings. Ideally, the patient measures, for example, his/her blood pressure at home, at work or on the way. However, timely "feedback" is a necessity for reliable, self-determined handling of the self-measured data by the patient. Only then, does the patient receive the required certainty for action and decisions, respectively a virtual therapy guided by the treating doctor are possible. Via the mobile phone, the feedback system becomes a closed circuit. In addition to the measured values and other text information, audio and image data can also be sent to the doctor over this bidirectional link between doctor and patient. Thus, data is not just transmitted from the patient to the data base, respectively to the treating doctor, but rather medical staff, respectively a system of specialists behind the data base, can influence the course of the therapy directly over an intervention path and individualize it. This principle is shown in figures 2 and 7.

Non-medicative therapies, for example acoustic biofeedback including circadian or gender-specific influences can be examined for the influence of blood pressure respectively the course of the therapy. In all these applications, the virtual laboratory permits obtaining authentic vital parameters in real time.

The telematic sensor-based therapy concept in dentistry realized in collaboration with Sense inside GmbH described in the following combines the requirements of individuality and feedback. For the first time, a real therapy is possible with this individualized and personalized assistance system.

Bruxism

Teeth-grinding or teeth-pressing, referred to as bruxism, is the source of enormous suffering for 8.2% of the adult German population. The consequences of teeth-grinding range from enormous muscle tension accompanied by headaches to major damage to the teeth and the jaw joints. Up to now bruxism patients were given a retainer to protect their teeth and jaw joints although it was difficult to determine which patients needed which treatment and when or whether the treatment was actually successful.

Figure 8: The SensoBite System for measuring jaw forces, www.senseinside.com

The symptoms of bruxism are tense facial muscles, muscle pain and headaches. In an advanced stage, the chewing muscles grow together; the crowns of the teeth are ground down. Tension of the neck muscles extending down the entire back and even tinnitus may be the consequence. In addition to this, the partner's sleep is also often considerably disturbed. Early diagnosis and fighting the causes should stand in the foreground of treatment and not treating the resulting symptoms. The SensoBite Systems showed in figure 8 makes this possible by combining analyses of the grinding behavior with a biofeedback system. The SensoBite System developed by us permits comfortable, reliable measurement of the jaw forces (clamping down forces and times). The system supports bruxism patients with effective and cause-based healing of the disorder with precise diagnosis and individually adapted therapy. Such an aid contributes actively to adaptation of therapies to the individual and to developing new therapies. By being able for the first time to check the individual effectiveness of known therapies, the system is also of great use for clinical research. The SensorBite System comprises measuring electronics and transmission electronics, a receiver, which is located outside the body, and software for data analysis. The miniaturized, flexible sensor electronics measure the pressing forces on the retainer and can be placed in a conventional retainer. The data are transmitted wirelessly from the body via an integrated radio transmitter and in real time. Included is a receiver, which records the data, transmitted from the mouth. Having the size of a matchbox, it fits easily in the patient's trouser pocket. In addition, the receiver offers a biofeedback function via a vibration alarm to inform the patient when bruxism occurs. With the software, the treating doctor, respectively the patient can graphically display and analyze the recorded Bruxism events. In this manner, diagnosis as well as observation of the course is possible in the patient's customary home environment without influencing the quality of the patient's sleep or thus the measuring result. Worn day and night, the system records all bruxism events and using the obtained data, seeks and evaluates the best form of retainer and of therapy for the patient. Bruxism analysis has up to now been inadequately possible as it is either dependent on the subjective perception of the patient or long-term changing symptoms such as abrasion and muscle pain. SensoBite System makes it possible to detect a change in grinding behavior after just a few nights allowing to check the success of the selected therapy immediately and, if necessary, adapt it accordingly without having to wait six to eight weeks for the results.

Biofeedback (Therapy)

The SensoBite Biofeedback offers effective, novel support for curing the cause of bruxism. A small device that informs the patient during the day by means of biofeedback (vibration) that tension is manifest can effectively mitigate the tension without any negative effect on the patient's quality of life. Informed about the tension in the jaw region, the patient can find relief by means of special relaxation [11, 12]. The SensoBite-Biofeedback System enables patients to fight manifest bruxism effectively during the day. In this way, they are able to contribute to clarifying pecularities and to contribute to a useful therapy.

Prospects

As the retainer is well-suited as a trial instrument for implantations, it follows to utilize the obtained know-how and information for intelligent implantations, which due to increasing miniaturization are gaining in significance for solving complicated medical problems. We are presently doing research on a system platform with the help of which sensor data can be transmitted wirelessly from implanted systems in the patient's body. First results from a research project for monitoring osteoneogenesis (curing bone disease) are very promising.

Conclusions

Linking electronic media and systems with medical sensors opens the path for individualized and personalized telematic medicine. Like in the environment of other specialist systems, individual medical data can be collected with data of superordinate data bases to provide, when needed, personalized information. This is particularly helpful in an aging, mobile society which in future will face decreasing doctor density and which already is dependent on the presence of such systems especially in the rural areas. People's self-determination regarding information, largely realized in other realms of their lives is now extended to the area of medical information and permits, in addition to a healthier lifestyle, greater mobility in old age. Various systems and concepts for diagnostic and therapeutic medical assistance in the areas of asthma, chronic obstructive lung disorders (COPD), cardiovascular disorders and bruxism are described as examples.

Acknowledgement

We are deeply indebted to the Heinz Nixdorf Foundation, Synergy Systems, the Klinik Höhenried and T-Mobile for their generous support. Ambient Medicine® is a registered trademark belonging to the Heinz Nixdorf-Lehrstuhl für Medizinische Elektronik of the Technische Universität München.

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Annex 3

Italy: Deaths on Board Ships Assisted by Centro Internazionale Radio Medico (CIRM), The Italian Telemedical Maritime Assistance Service (TMAS) from 1984 To 2006

I. Grappasonni [1], A. Di Donna [2], C. Pascucci [1], F. Petrelli [1], F. Sibilio [1] and F. Amenta [1,2]*

Introduction

The majority of people on board ships are in a disadvantaged situation in comparison with ashore-living people which, if necessary, may have medical services available within a short time. Only a few ships carry a doctor or adequately trained paramedic personnel on board and the majority of vessels are at sea for days or weeks before they can reach a port. Hence, the most reliable possibility of treating diseases or accidents on board is to provide medical advice via telecommunication systems. At the present, several organizations world-wide give medical assistance to ships without a doctor on board [1, 2].

The Italian experience in the field of medical advice to ships started on April 1935, with the activity of Centro Internazionale Radio Medico (CIRM). CIRM was established with the purpose of providing free medical assistance to ships without a doctor on board of any nationality and navigating on all seas of the world [1,2]. CIRM, recognized by the Italian government as the national Telemedical Maritime Assistance Service (TMAS) has assisted more than 60,000 patients, mainly on board ships, being the organization with probably the largest experience in the world in the field of maritime telemedicine. CIRM medical assistance is provided in Italian or English for 24 hours a day. The doctor on duty receives the request of assistance and gives instructions for the case, establishing the dates of appointments according to the gravity of diseases under treatment.

Seafaring represents a hazardous occupation when compared with shore-based activities and seafarers may be exposed to risks rarely encountered by workers in other occupations. Unfortunately only sparse epidemiological data are available on the reasons for the death of seamen during their career [4,7,10,11,13,14]. The present study has analyzed causes of deaths on board ships assisted by CIRM from 1984 to 2006.

Epidemiological analysis

Retrospective analysis embraced all deaths among seafarers assisted by CIRM between 1st January 1984 to 31st December 2006. For each patient assisted, a digitalized medical file is established and updated following every contact with the ship. These files did establish the basis for the present study.

Analysis was made by reviewing 21,869 files of patients assisted by CIRM during the time chosen. Files of cases in which patient death occurred were extrapolated and analyzed. Presumptive diagnosis of CIRM physicians was classified according to the International Classification of Diseases (ICD)-10 [6]. The ICD is the international standard diagnostic classification for all general epidemiological, health management purposes and clinical use. When possible, causes of deaths were referred to the age of individuals, their rank on board, to the circumstances and to the number of crew members in the ship where it occurred.

Death data were then analyzed statistically by assessing cause and specific mortality rates.

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Results

As mentioned above, during the period considered CIRM has assisted 21,869 patients on board ships. Figure 1 summarizes the total number of patients assisted by CIRM in the 22 years considered. As shown, compared with the past, the number of patients assisted by the Centre is increasing significantly in the last 4 years. The increase in maritime traffic worldwide, the improvement of telecommunication systems allowing an easier contact in case of diseases or accidents on board and the augmented sensitivity to health protection in seafarers is the most probable reasons for the increase in medical assistance cases recently observed. Deaths occurred were 339 (1.55%). Excluding fatalities involving passengers or other transported people, deaths were 300 (1.37%). Specific causes of deaths are summarized in Table I.

Table I – Causes of deaths among patients assisted by CIRM in 1984-2006

Cause	***Deaths total***		***Deaths excluding transported people***	
	No.	**%**	**No.**	**%**
Diseases of the circulatory system (I00-I99)				
– Ischaemic heart diseases (I20-I25)	138	40.7	116	38.7
– Hypertensive diseases (I10-I15)	6	1.8	5	1.7
– Cerebrovascular diseases (I60-I69)	5	1.5	5	1.7
Diseases of the respiratory system (J00-J99)	11	3.2	9	3.0
Mental and behavioural disorders due to psychoactive substance use (F10-F19)	12	3.5	11	3.7
Certain infectious and parasitic diseases (A00-B99)	17	5.0	17	5.7
Endocrine, nutritional and metabolic diseases (E00-E90)	6	1.8	5	1.7
External causes of morbidity and mortality (V01-Y98)				
Accidental poisoning by and exposure to noxious substances (X40-X49)	12	3.5	12	4.0
Water transport accidents (V90-V94)	2	0.6	2	0.8
Exposure to electric current, radiation and extreme ambient air temperature and pressure (W85-W99)	14	4.1	14	4.8
Falls (W00-X19)	18	5.3	18	6.0
Other external causes of accidental injury (W00-X59)	25	7.8	25	8.3
Burns and corrosions (T20-T32)	4	1.2	4	1.3
Intentional self-harm (X60-X84) / Assault (X85-Y09)	7	2.1	6	2.0
Other	38	11.2	27	9.0
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99)	24	7.9	24	8.0
TOTAL	**339**	**100**	**300**	**100**

Sequence of the distribution of causes of death showed that cardiovascular diseases were on the first place, followed by accidents and violence, infectious and parasitic diseases, alcohol and drug addiction and respiratory system diseases. In approximately 8% of cases, cause of death was not established. Pathologies affecting cardiovascular system were the most represented among either crew-members and other transported people (passengers, stowaways ...).

Analysis of causes of deaths per different ranks of seafarers is summarized in Figure 2. Deck crews were the manpower with the highest rate of mortality. This is probably due to the larger number of deck crews on board compared to other workers. In deck crews the main cause of losses was represented by cardiovascular diseases, followed by external causes of death (poisoning, accidents, exposure to electric current, burns and corrosions…).

Figure 1: Total number of patients assisted by C.I.R.M. from 1984 to 2006

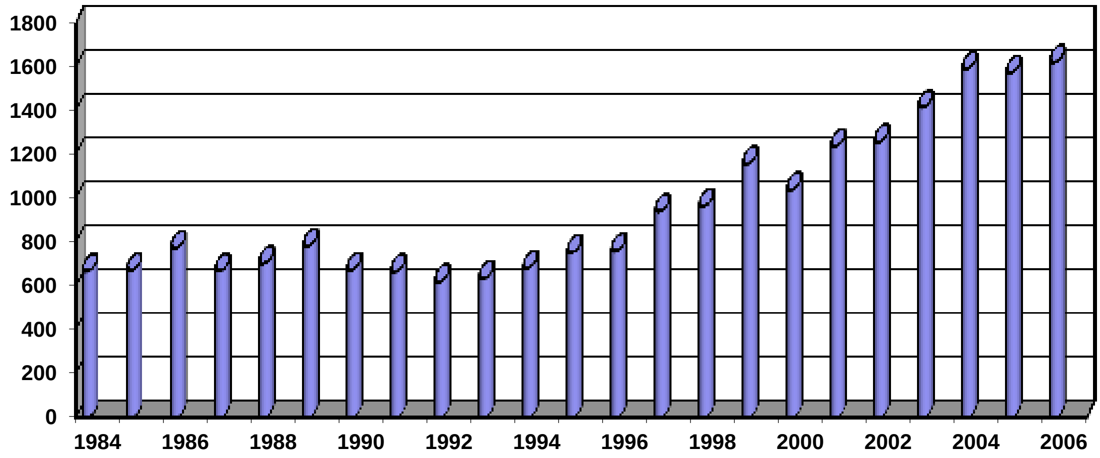
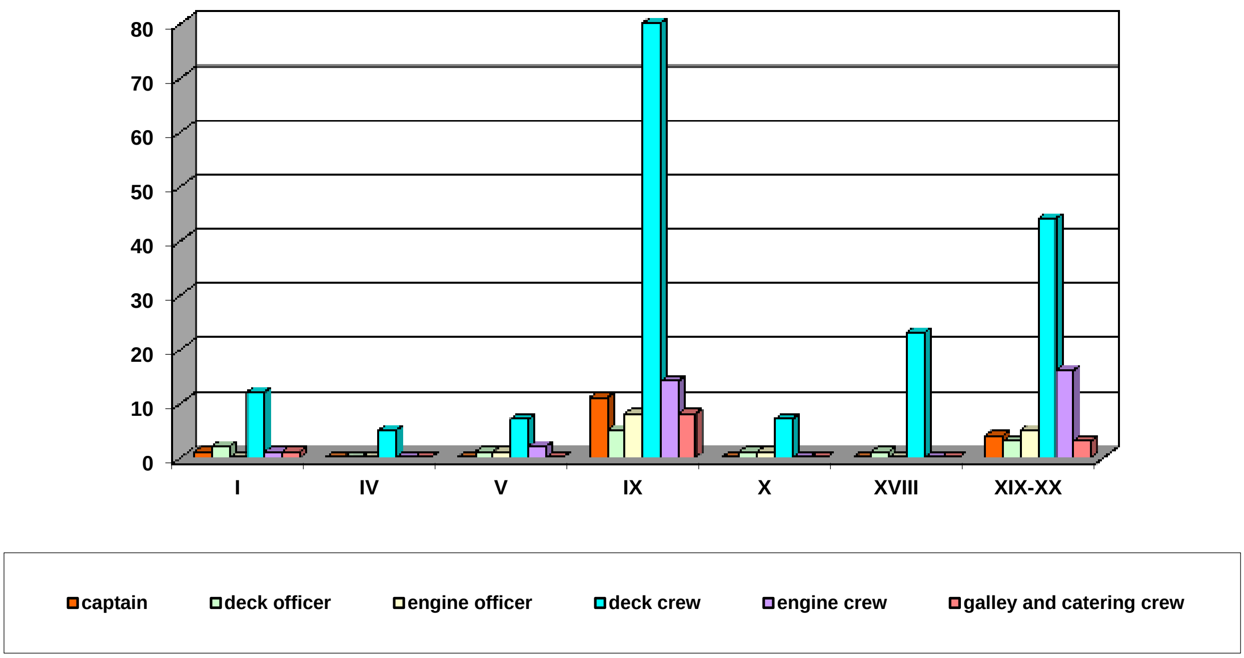


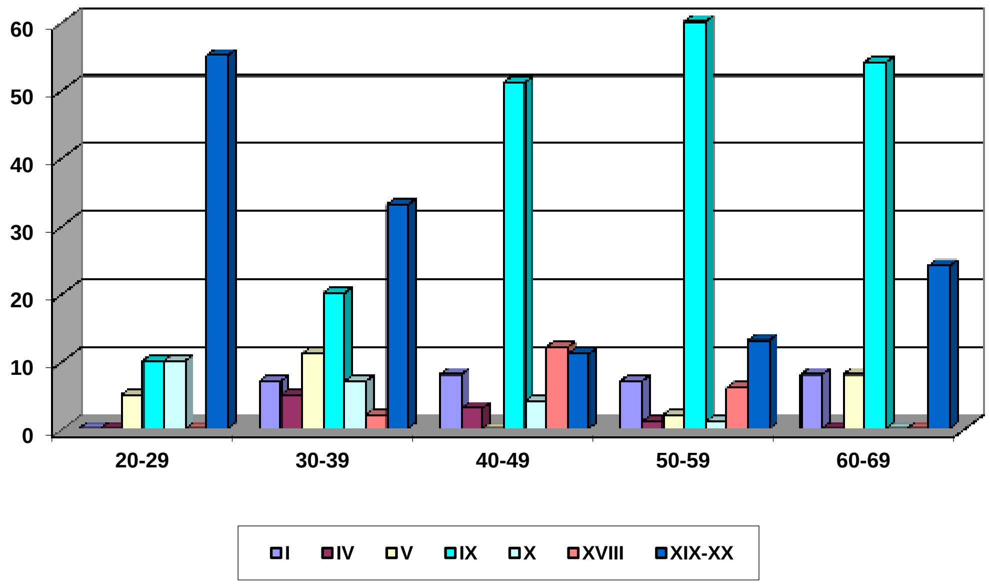
Figure 2: Deaths on board ships assisted by C.I.R.M. from 1984 to 2006 divided per rank of the crew members and per (ICD)-10 [6] class



(**I**-infectious diseases; **IV**-endocrine, nutritional and metabolic diseases; **V**- Mental and behavioural disorders; **IX**- Diseases of the circulatory system; **X**- Diseases of the respiratory system; **XVIII**- Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; **XIX-XX**- Injury, poisoning and certain other consequences of external causes-External causes of morbidity and mortality).

Evaluation of death cases by class of age revealed that deaths due to injuries decreased with age, whereas those caused by diseases of the circulatory system did increase (Figure 3). Manpower losses for injuries and accidents affected to greater extent youngest crew members aged between 20 and 29 years (Figure 3). Losses for cardiovascular diseases were on the first place as causes of deaths in the age groups between 40 to 69 years, with a peak in people aged 50-59 years (Figure 3).

Figure 3: Deaths on board ships assisted by C.I.R.M. from 1984 to 2006 divided per age and per (ICD)-10 [6] class



Discussion

Deaths in shipping are in general not registered with the local registrars of deaths, and are not considered in routine national mortality statistics. These losses are included in separated registrars depending on the flag of the ship or on the country of the port where the corpse landed. The present investigation is the first study on the causes of death on board ships obtained from data of a maritime telemedical centre. Our analysis therefore derives not from a post event evaluation of mortality reports, but from actual data of the reasons for mortality when patients were still alive or immediately after the event. In spite of the limits in assessing causes of death from a remote physician and without patient's direct examination, this kind of evaluation has the advantage of being undertaken very close to the moment of death and therefore may be relevant for the identification of situations of high risk of death for seafarers and for establishing possible prevention measures.

Among the causes of deaths, diseases of the circulatory system were at the first place, followed by the so-called external causes. Comparative analysis of our data with those of recent studies on causes of deaths on board ships [4,7,-14] confirmed that cardiovascular causes represent indeed the first cause of mortality in sailing seafarers. These most recent data are not consistent with the view dominant around the last quarter of past century that cardiac and cardiovascular disorders were less prevalent in seamen compared to populations on the land [3]. The less favourable age structure among seafarers at the present, the lack of adequate prevention measures and of technical facilities (e.g. systems for transmitting via telecommunication systems basic cardiovascular and blood chemistry parameters) are the most probable cause of the increased risk of mortality for cardiovascular causes reported by the majority of recent investigations on the topic [4,7,10,13].

The prevalence of cardiovascular diseases as cause of deaths on board ships deserves particular attention for developing preventive measures including intensive campaigns for adequate lifestyles and the availability on ships of digital electrocardiographs and automated external defibrillators. These may have a real utility for diagnostic purposes, resuscitation as well as for verification of death.

Accidents represented the second cause of deaths among seafarers assisted by CIRM. Different from other reports [1,2,6], the percentage of manpower losses due to external causes was less than the 25% of total deaths. The observation that the majority of deaths affected deck crews is probably related to the greater number of these workers compared to others. An interesting finding in terms of epidemiological analysis is the observation that deaths referable to accidents affected to the greatest extent younger people. It is largely reported that injuries occur most often in young seamen probably due to their lack of enough experience and to a yet limited adaptation to the life and work on board [3]. The fact that the youngest age group is mainly affected by external causes of mortality indicates the need of more adequate training of seafarers of this class of age as a main preventive measure.

To sum-up, cardiovascular and external causes represented the main reasons of deaths among seafarers assisted by CIRM in the last 22 years. These main causes of mortality may be sensitive to preventive measures, which would be appropriate to increase for augmenting standards of human life safeguard at sea.

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Annex 4

Japanese Telemedical Concept of Ambulatory Application

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Objectives

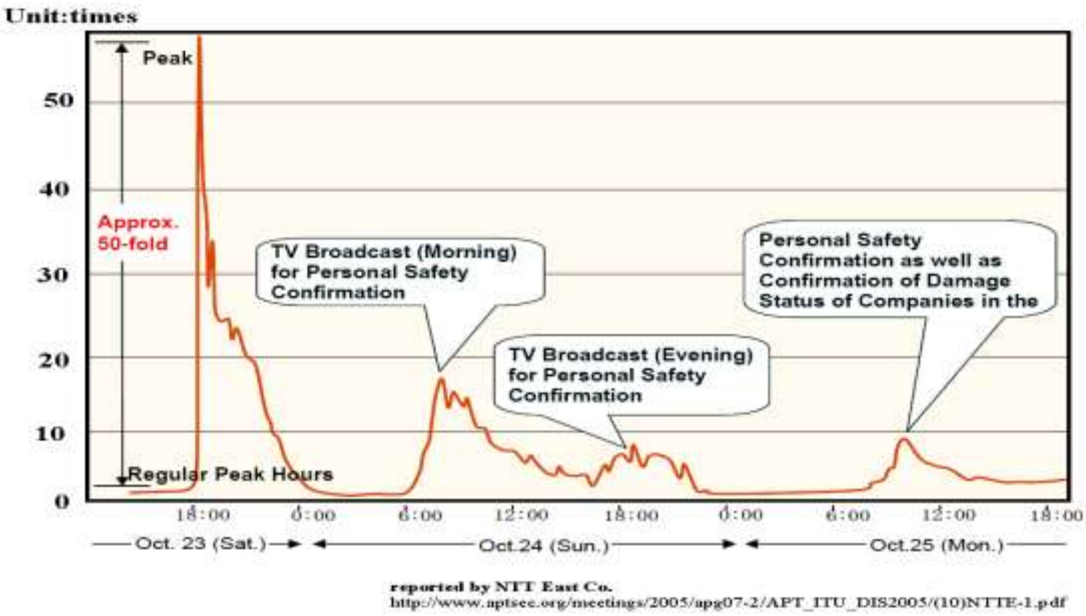
Transmission of in-ambulance data without inconveniencing or undue effort on the part of the rescue crew – in other words, automation of in-ambulance activities (measurement/analysis, activity recording, and message transmission) – is essential in implementing uniform medical control standards across the nation. One of key elements for this automation is communications technology (CT). Its development is a must for emergency transportation for the near-future. Currently, no country has succeeded in supporting patients through CT on board ambulances. As an ER doctor, I strongly believe the need to do so will grow in the near future. This paper describes our basic concept of CT to support ambulatory application.

Technical Communication Background

What is CT?

The purpose of in-ambulance CT is to improve emergency rescue quality by transmitting patient data and ambulance GPS data to the triage center automatically, with no inconvenience to or undue effort by the crew. Ideally, CT would connect the patient monitor online with TCP/IP and record crew activities automatically and electronically. In reality, time standards for the ambulance clock, cardiograph, and communication devices are not synchronized in Japan, and rescue crews must match these manually every morning. Synchronizing these devices would be a simple matter if the devices were linked via TCP/IP connections.

Figure 1: Calls to Niigata over the public phone network during the Niigata Earthquake from nationwide. October 2004, over 50 times higher than normal



The third Generation (3G)-Mobile phone

Some believe communications with moving ambulances should be based on the 3G mobile phone network. Is this correct? Is the 3G mobile phone network good enough to ensure multi-path high-speed transmission from fast-moving ambulances? The answer is no, even in Japan, where a 3G network is established nationwide.

Multi-path communication:

This technology is not yet established. If the base station antenna is located very close to the mobile terminal and communication occurs in line-of-sight mode (Nakagami-Rice fading), communications will be reliable and stable and throughput close to nominal values. But in non-line-of-sight mode (Rayleigh fading), communication is not reliable under multi-path conditions, resulting in inadequate throughput. Maintaining a 384kbps connection rate (the FOMA uplink standard) during transmission from a moving car is quite difficult. None of the various studies involving transmissions from ambulances using the 3G network have led to introduction of a practical system.

Service area problems:

The number of base stations for the NTT DoCoMo 3G FOMA Service is now at around 3,200 in the Kanto-Koshinetsu area and 10,700 across the nation, with service areas expanding. The population coverage is about 98% nationwide as of the end of December 2007. This coverage, however, counts all city/village citizens when their local administration office exists in a service area. Undoubtedly, this approach counts mountainous areas and remote islands that are actually located outside service areas. Since mobile phone carriers follow profit-oriented market dynamics with the cream-skimming policy (shedding unprofitable areas), they will not invest money to construct base stations in these areas. Even with the advent of the 4G network, they will likely focus on urban areas while shortchanging rural populations.

Public wireless LANs

Are public wireless LANs useful? Wireless LANs are already in service at railway stations, airports, and main streets. If this system is deployed everywhere, broadband communications will be possible for public rescue vehicles such as patrol cars and ambulances. In an experiment, a Gifu (Japan) national road was equipped with a wireless LAN (Route-make terminals) by the Takayama National Road Office of the Land and Transportation Ministry. Since this assumes line-of-sight communications, transponders connected to NTT networks must be placed at every 0.5 to 1.0 km. Adopting this system for roads across the nation would involve exorbitant cost and infrastructure demands.

Geostationary satellites

"Geostationary satellite" is the term for a communication/broadcasting satellite that remains at a certain orbital altitude above a specific point on the Earth at all times. They orbit in synchronization with the surface of the Earth at approximately 36,000 km above the equator. They are called geostationary because they appear fixed in the sky when viewed from the ground. One geostationary satellite can cover the whole nation. However, there are two technological issues posed by the limited transmission power of the ambulance and antenna gain when sending data at a high speed from a moving mobile terminal.

– Blocking by buildings (communication interruptions);
– Gain-to-noise temperature ratio (G/T) of the satellite receiver antenna.

Problem 1 occurs because Japan is located at mid-latitude, not at the equator. G/T in 2) expresses sensitivity on the satellite side – a ratio of front gain G to overall noise temperature T on the receiver side. A common way to increase gain is to use higher frequencies and increase area antennas with fine mirrored surfaces.

Quasi-zenith satellite (HEOs)

As required by Kepler's second law, sweeps across equal areas of an ellipse take the same amount of time. If there are three satellites and each of them appears over Japan at zenith every 8 hours, this is the same as one satellite being present 24 hours. Such systems have already entered practical use in Russia and the USA. These satellites can avoid propagation blockings caused by buildings and can be used efficiently when combined with a geostationary satellite that provides another line-of-sight propagation (directional diversity). The successful development of a large expandable antenna of spacecraft also makes this system more feasible. This system is now expected to be used for disaster prevention and emergency rescue. Japan will launch GP-use quasi-zenith satellites incorporating Ku-band transponders in 2012.

Current status of the public phone network (immediately after a disaster)

Immediately after a disaster, the number of calls placed over the public phone network increases sharply. The resulting congestion can make connections highly unreliable. For example, immediately after the Niigata earthquake, as shown in the figure, the number of calls increased by a factor of 50. The Erlang-base call loss ratio (connection failure probability) rises to 0.99 or above. This means that even 100 calls will fail to ensure a single successful connection. In short, public networks are of limited use during times of disaster. A disaster/emergency rescue-dedicated network is needed, independent of the public network and capable of nationwide coverage.

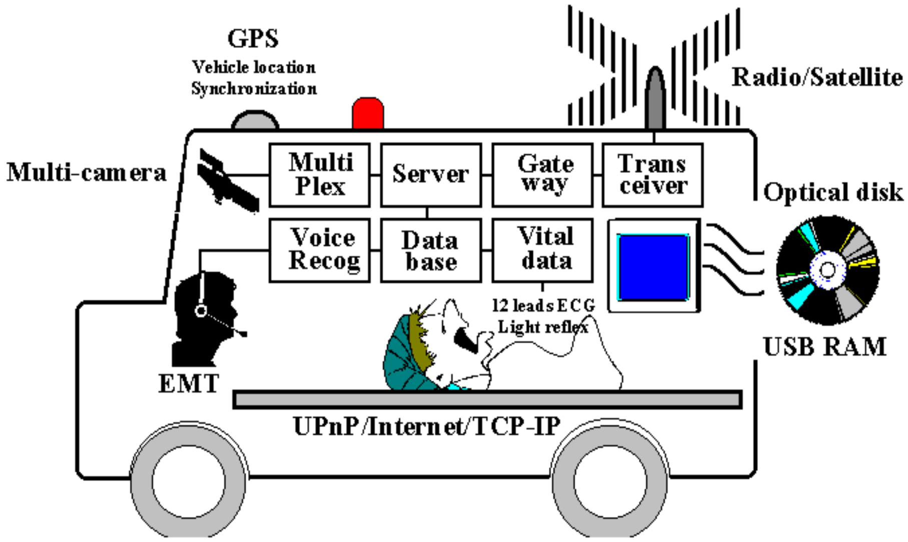
Universal Service Fund

Carriers competing in the free market are free to shed services for emergency rescue, for the disadvantaged, and for people living in remote areas. A universal service fund which is possible in stable economies, aids in such situations. The International Telecommunication Union (ITU) recommends the deployment of this system in many countries, based on a WSIS (World Summit on the Information Society) action plan for resolving digital-divide issues.

In Japan, an extra charge of 7.35 yen/month has been imposed on each call across the board since March 2007. This fee is used to support services in high-cost remote areas in Japan; in other developed countries, a similar fee is used to fund communication applications related to medical care and education. In the United States, $50 million was paid out in 2007 for medical services for telemedicine to help those living in remote areas.

A 100% cash back or tax relief measure should be considered as part of a universal service policy to support wireless and satellite networks for emergency rescue-dedicated purposes.

Figure 2: Telemedicine supported system Real time clock on each device to synchronize the computer time setting with Universal Plug and Play



CT assisted Treatment Technology

Emergency rescue activity record

Electronization is the key for quickly creating accurate activity records. Providing accurate information to the destination hospital is crucial, as is transmitting data back to a PC at the station automatically to minimize inconvenience. For this purpose, a system of handy PDA-like terminals must be provided to rescue crews, and a gateway system deployed to send PDA data to the network from the ambulance.

Voice recognition (particularly dispersion-type voice recognition) to eliminate the inconvenience of character input for busy rescue crews represents a challenge in innovation that Japan, as a leader in the development and international standardization, should be fully equal to. Other electronic tools will be needed to assist rescue crews improve their skills in providing medical treatment in an ambulance, as well in searching for hospitals. Additionally, electronic support is an essential element of a safe first-aid system capable of reliably identifying serious hidden symptoms.

Medical control via communications circuit

In Japan, the medical treatment of patients in the ambulance poses difficult issues because it falls under the purview of two different ministries – the Ministry of Public Management, Home Affairs, Posts and Telecommunications and the Ministry of Health, Labor and Welfare. Medical control based on a Notification by the Fire-Defense Agency Emergency Rescue Manager involves 1) early instructions to the rescue crew; 2) doctor’s post-verification of the treatment provided; and 3) continuing education and training of rescue crew.

The restrictions imposed by Article 20 (which requires a face-to-face diagnosis) under Medical Law can be lifted when a reliable communication network is used, according to Notification No.1075 of the Health Policy Bureau, Ministry of Health, Labour and Welfare, issued December 24, 1997. A revised Notification further permits so-called telemedicine via networks for patients in ambulances.

In short, Japanese law permits medical control of rescue crews (for basic treatment and care) and higher-level treatment by the triage doctor located at the triage center. However, a high-quality communication path is the minimal condition necessary.

Specific diseases

Successful treatment of coronary clogging is known be highly likely if an acute heart attack patient receives medical treatment in the ambulance and a thrombolytic agent is administered within 60 minutes of identification of a vein route by the rescue crew. This treatment, however, may cause bleeding in the skull, making it necessary to monitor blood pressure constantly. An echocardiogram and a 12-lead electrocardiogram are essential for correct diagnosis of a heart attack, whereas the position of certain clots is easily detected by heart auscultation based on independent element analysis. This technology has been considered in certain countries where the patient must remain for relatively long periods in an ambulance, and related papers have been published by IEEE and APT.

The CT-based medical control will be effective with various patients suffering from cardiac or respiratory arrest and external injuries, as well as acute heart attacks. While not a magic bullet, this technology will enter actual use in the near future. CT offers high potential for improving prognoses and eventually reducing medical costs.

Networking in-ambulance devices

At present, the measurement devices in ambulances are not connected to any networks. They are not even synchronized automatically. At present, the best solution appears to be to network them and to transmit data via a TCP/IP intranet on board the ambulance. Listed below are the parameters that must be monitored.

A: Macintosh with integrated type of CCD camera (Pharyngoscope)

With the hard type of the pharyngoscope, we can extend a larynx and observe the whole larynx under the line of sight. With the integrated type of the small CCD (Charge Coupled Device) camera, we can monitor and record the process electronically, and transmits image data via telecommunication circuit. Especially, it supports a procedure of an endotracheal tube insertion and/or removal of a foreign body in trachea. Without this monitor, a 20 % of patients will be misplaced tube and will become severe hypoxia during transportation.

B: Light reflex image (Pupillometer)

Conventional methods of analog papillary light reflex examination performed inside emergency vehicles tend to be associated with significant amounts of error that impede precise quantification of changes in pupil size. To establish a simple method for quantifying nervous function in prehospital care, we applied a technique for processing video images captured by a CCD camera to enable accurate measurements of the rate of change in pupil size. While this method can be used to assess either direct or consensual light reflexes, we focused in this study on an ipsilateral (direct light) reflex pupillometer, since this choice raises technically more challenging issues and is expected to result in significantly smaller design [09]. Based on this image, it should be possible to diagnose not just brainstem problems, but dementia and peripheral nerve disorders. The shrinkage speed of the pupil declines in Alzheimer disease and the diabetes.

C: 12-lead electrocardiogram

The 3-lead ECG that we all use with our monitors on a regular basis can only detect an arrhythmia. Because the 3 leads placed in the anterior thoracic monitor myocardial electric activities with hexaxial view. While the 12 lead ECG shows not only hexaxual view, but also the cross section view, for example in a transverse horizontal plane with V1-6. So we can make a diagnosis of acute myocardial infarction with reciprocal changes of ST elevations.

Europe is the leader in this field, while in Japan Yokohama City has just introduced the technology. It provides information on ischemic heart disease during transportation and enables early aid for improved prognosis and reduced medical cost. This should prove useful if it can be automated and network connections made easier.

D: Automated ultrasonic measurements

A serious blunt thoracic injury has to be treated within 60 minutes after an accident. There is a strong possibility of heart injury and/or of great-vessel-injury that shown fluid collection in a thoracic cavity. In the same way, the abdominal blunt trauma has a risk of hepatic injury and/or injury of inferior vena cava. So EMTs have to rule out the fluid collection in the peritoneal cavity with ultrasonic tomography.

With robotic arm holding curved array scan probe, the US army continues to issue academic reports on automated measurement of heart wall movements for ischemic heart disease or trauma victim to check the absence/presence of thoracic fluid collection [10].

Discussion

Vision of medical controls for the near future

Emergency transport and medical care are intertwined. The extension of medical control is based on telemedicine and care by triage doctors located at medical control or triage centers. The ultimate goal is to improve prognoses and extend patient life expectancy. While ambulances are operated by the Fire Defense Agency, patients require prompt medical care. There is no question concerning the importance of prehospital care in reducing medical costs, which amount to 30 trillion yen annually in Japan.

Each prefecture currently operates a medical control center. However, assuming that the medical control center is only necessary for patients in serious condition (approximately 10%), one center should suffice for each Dou or Shu (state: 6–10 in total). Another important goal is nationwide equality in such services. The former or prefectural-based medical control center service aims to provide a service based on local conditions, while the latter, or Dou/Shu-based medical center service, places the priority on economy and equality. In either case, there will be no progress in medical control without the development of CT that can be effectively used in emergency transport.

Case of cardiac infarction

In Japan, heart attacks rank second as a cause of death; in FY2006, 172,875 died of heart attacks. Annually in Japan, 49,000 people experience acute cardiac infarction. According to nationwide statistics for emergency transport for FY2006, heart disease patients accounted for 9.3%, or 271,943, of all those transported. It appears that close to half the patients struck by acute cardiac infarction die within one hour. The causes of death are cardiac arrest due to Ventricular Tachycardia, Ventricular Flutter, and Ventricular Fibrillation. A significant number of patients may be saved if they receive proper treatment within one hour after the attack. The patients who are lucky enough to be transported to a CCU in emergency centers are in most cases given thrombolytic agents while undergoing PTC (Percutaneous Transluminal Coronary) operations to remove the coronary thrombus. Thrombolytic agents are reportedly effective even when injected into a vein, if injected in the early stages (within one hour after the attack). In fact, some trials of thrombolytic doses in ambulances have been initiated. However, it is known that all thrombolytics pose the possible risk of cerebral hemorrhage. For example, a thrombolytic thrombolyse, now used in the emergency rescue center, resulted in cerebral hemorrhages among three patients, two of whom eventually died in Japan, although the number of such incidents was relatively low. Thus, the use of such thrombolytics without question requires continuous monitoring of blood pressure and blood pressure control by medical experts. In case of remote medical observation in the ambulance during transport, a patient struck by an acute cardiac infarction will be performed suitable triage by specialist at Triage Center with transmitting 12-lead ECG, and Echography. After suitable diagnosis by specialist, a shot of a thrombolytic agent PTCA should be administered into vein. Assuming that early-stage treatment is successfully performed by administering thrombolytic agent into the patient’s vein in the ambulance, we estimate a reduction in medical costs for the treatment of acute cardiac infarction, based on the following assumptions:

- Ten percent of the 271,943 heart disease patients transported in emergencies have just been struck by acute cardiac infarction (equal to 41% of patients struck by acute cardiac infarction are transported to hospitals via ambulance).
- It is possible to use telemedicine during emergency transport to isolate the cause of the problem as acute cardiac infarction, based on data provided by a 12-lead electrocardiogram and cardiac ultrasonic imaging.
- If an ambulance technician administers a vein dose of a thrombolytic to the patient under the instruction of doctors, the rate of improvement appears to be around 60%.
- A patient whose condition improves thanks to early intervention will return home after a 7-day hospital stay, while a patient for whom the intervention has no effect is hospitalized 21 days on average.
- The medical cost per hospitalized patient per is US$1,200 per day.

Reduction in medical cost during 10-year implementation = US$ 2 Billion. This is the amount of reductions in medical costs made possible by pre-hospital care in the event of acute cardiac infarction, based on assumptions 1) to 5). If the calculation is expanded to include cost reductions in other acute diseases and injury, medical expenses can be expected to be reduced even more dramatically. One solution for curbing medical expenses in Japan, which is currently growing 5% annually, is improving pre-hospital care. Proper implementation of this project requires high-speed data channels, since these will enable doctors to see the conditions of the patient in an ambulance as if the patient were in the next room. The communications channel is one of most promising solutions.

Momentum for international standardization

ITU-T (International telecommunication Union, Division of Telecommunication) SG16 Q28 is currently boosting the standardization of telemedicine technologies. Tasks related to this standardization effort are currently underway in each member nation. Now is the time for member nations to propose PDA specifications for use by rescue crews and procedures for emergency rescue wireless communications.

Conclusions

High automation (automation of measurement, recording, analysis and transmission) of ambulance-borne devices is the goal of CT. Emergency transportation for the near future is expected to enable data transmission from ambulances automatically, without inconvenience to rescue crews, resulting in high-quality services available uniformly across the nation.

As of May 2009, no country had succeeded in deploying a high quality communication path for mobile terminals, although this remains essential for the smooth implementation of medical controls.

We are certain medical controls will be much improved in the near future both in quality and content as CT integration proceeds and that such CT will significantly improve patient prognoses.

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Annex 5

Oman: eHealth Plan – Key Issues

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Geographical Features

Sultanate of Oman is located in the south eastern corner of the Arabian Peninsula. Its coastal line extends 3,165 kilometers from the Strait of Hormuz in the North to the borders of the Republic of Yemen, overlooking three seas: the Arabian Gulf, Gulf of Oman and the Arabian Sea. It borders Kingdom of Saudi Arabia and United Arab Emirates in the West, the Republic of Yemen in the South, and the Strait of Hormuz in the North and the Arabian Sea in the East. The total area of the Sultanate of Oman is approximately 309.5 thousands square kilometers. The Sultanate is composed of varying topographic areas consisting of plains, wadis (dry river beds) and mountains. It is administratively divided into 5 Regions and three governorates with 59 Wilayats.

Demographic Features

The first General Census of Population was carried out in Sultanate of Oman in December 1993. The census reference night was 30/11 - 1/12, 1993. According to the census, the population of Oman was about two million of which about 27% were non-Omanis. According to mid year population for 2005 the Omani population shows a sex ratio of 102.1 males per 100 females. It is a young population, about 38.9% of the population is under-15 years old, and only 3.5% are 60 years and over. About one quarter (26.9%) of the total Omani population is females in the reproductive age group (15-49 years). They represent nearly 54.4% of all females and about 50.2% of them are expected to be married.

Organization and Health Policy of the Ministry of Health

The Ministry of Health (MOH) is responsible for ensuring the availability of health care to the people of Oman. In course of implementing its health development plans, the Ministry's organization had to be adapted in tune with the strategies and objectives that were crystallized during 1990. These can be summarized broadly as:

1 Regionalization of health services and decentralization of decision making in specified technical, administrative and financial affairs.

2 Emphasizing the role and importance of planning.

3 Development of Education and Training in health.

4 Emphasizing the importance of health systems research.

5 Emphasizing the importance of regional and international relations.

In 1990, MOH adopted decentralization policy, the Directorates-General of Health Services and the Directorates of Health Services at Health Regions are vested with the responsibility for the delivery of comprehensive health care through a network of hospitals, health centres and mobile units.

The decentralization policy of MOH and the setting up of multi-speciality regional hospitals, supported by a strong apex hospital (the Royal Hospital), together with effective planning and management at national, regional and wilayat level and the emphasis on health care human resources planning and development of health management information system, etc. have helped to achieve higher efficiency and effectiveness of the health care system. As an immediate outcome of the improved health care, the Sultanate has achieved increased self-reliance in the treatment of most diseases which helped in saving enormous expenses of treatment abroad. Later, Ministry of Health has adopted a policy of hospitals autonomy. It is expected that hospitals will be able to adopt their decisions according to their own performance indicators and their resources which is expected to be reflected on the health status of the people.

Other organizations also provide health care for their employees and dependents. These include the Ministry of Defence, the Royal Oman Police and the Petroleum Development Oman. In addition, there is the Sultan Qaboos University (SQU) Hospital that serves as a teaching hospital and provides tertiary care. The private sector has also been playing an increasingly important role in providing health care over the past few years.

Telecommunication Services

There are three telecommunication service providers, as of June 2007; Omantel, which is the only service provider for the wired telecommunication services, including Internet, fixed phone service, and digital links. Last year (2006), it signed an agreement with the government of Oman for providing broadband connectivity and communication media to all government entities over the country.

Omantel has few running projects such as lying optical fiber for information superhighway, ADSL, and MPLS which is approved technology for the e-government portal.

Other telecommunication services providers are Oman Mobile and Nawras. They provide wireless services such as cellular mobile telephone and other wireless communication.

e-Health Strategy

The computerization in the ministry of health started in 1987, in a National Referral Hospital called “The Royal Hospital”, which was the first hospital in Oman opened with computerization.

In 1990, a specialized dedicated Unit for IT was created in the Ministry. In 1997, the first Computerized Health Centre was implanted after the decision of building an indoor system was considered. In 2004, the Information Technology (Computer Department) was upgraded to the level of Directorate General with 4 departments and 15 sections, and it is called Directorate General of Information Technology (DGIT).

MOH has a comprehensive computer system automating all the processes of healthcare delivery institutions to almost making them paperless. There are **over 140** computerized health institutions across the Sultanate, including all the major institutions.

The electronic system covers all parts of the patient file. All processes in the health institutions have been computerized, including PACS system in some hospitals.

Drug Information System (DIS), which is software used to help doctors to have wide idea about any medicine and review side effects and interaction with other medicine, has been integrated to the clinical system. The system is also integrated with SMS to inform and remind patients about their appointments, and to remind people to denote blood. Research, Statistics and Administrative Reports are automatically created by the system.

The e-health strategy states that the usage of ICT in **ALL processes** of the Healthcare Delivery System in order to streamline and make them cost-effective and to make ICT applications **tailored** to all requirements of Health Institutions, and also providing necessary information for planning and other research purposes.

There are two objectives behind this strategy to improve the Healthcare Delivery System, increase efficiency level, and to contain the Healthcare costs.

To sum up, Ministry of Health has been requested to plan for a National ***e-Health*** Portal to be used by other government s and non-government organizations. The 58th World Health Assembly Resolution on ***e-Health has*** requested MOH to build a National ***e***-Health Strategy and to create a National ***e***-Health Committee, including all concerned governmental and the private sectors.

Electronic Medical Record (EMR) has been created using international standards to automate all processes including referral system, which automates request for Appointment, Consultation feedback, and Request for Second opinion.

Tele Education in MOH

Feasibility of tele-education project has been discussed since 2002. The main goals are to:

- Exchange the medical knowledge among medical staff in the different institutions around the country.
- Conduct technical meetings and conferences.
- Broad second opinion and consultation.
- Reduce the doctors' internship duration, by having part of the internship locally using videoconferencing facility to interact with universities.
- Create an electronic medical library as a reference to the medical staff.

Professor L. Androuchko, Consultant in International University in Geneva, and Rapporteur of Telemedicine Group (ITU) was invited twice by MOH.

The following points were listed in his report on the last visit, which took place in Muscat from 10 till 19 April 2004.

The Ministry of Health does not need the "classical" videoconference solution. It is necessary a videoconference system for medical education which has to be also integrated with the existing HIS (Hospital Information System) and PACS (picture archive communication system), and meet the requirement of medical provincials, doctors and other medical staff.

There is one very important point which distinguishes the videoconference system for the Ministry of health from many other videoconference systems. The medical conference or any type of medical training requires transmission of many medical images (X-ray, Ultrasound MRI, etc) with very good quality which has to be checked and approved by doctors. It is not enough to see the face of a lecturer and hear his voice (as it is for any business meeting), it is much important to provide transmission of different medical images with a required quality.

It is necessary to establish a videoconference network for the Ministry of health. From the angle of network design has to be done taking into account the global goal of the Ministry- gradually provide videoconference facilities to all regional hospitals and other important medical institutions for medical education and then use them as a platform for introduction of other e-health services when and where they are required.

Medical education needs a good medical library. It is important to have an electronic library based on modern web technology and it has to be design taking into account the necessary requirement for reliability and security.

Conclusion

To sum up, MOH has started e-health project and there are many health institutions which belong to MOH has been computerized. However, there is always a room for improvement; Firstly, to complete e-links connectivity among all health institutions, and create national repository of the e-Health Record, where a summary of all health transactions be collected at a centralized database.

It is also very important to create ***e-Health*** Legislation and obtain information security Accreditation.

The National ID Number is also considered to work with or replace the existing patient ID. Last and not least, Tele-Education and Disaster Recovery Systems are at the top of the future plan.

Annex 6

Philippines: A Telemedicine Program Utilizing Short Message Service (SMS) for Remote Village Doctors

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Introduction

The Philippines is faced by an immense public health crisis as a result of the migration of health professionals to foreign countries due to economic reasons. Furthermore, majority of health providers who opt to stay in the country, particularly the specialists, situate themselves in urban areas for better professional practice [1]. This brings about a disparity in health care delivery especially in the remote and underserved areas of the archipelago.

The government made steps to augment this phenomenon through the Doctors-to-the-Barrios (DttB) Program of the Department of Health (DOH). The DttB Program aims to deploy doctors, mostly general practitioners, to "depressed, unserved/underserved, hard to reach and critical fifth and sixth class municipalities without doctors for at least two years [2]." With its sixteen years of implementation by the Health Human Resource Development Bureau of DOH, the program has deployed hundreds of medical doctors in various rural communities across the country [1]. However, since majority of these doctors are general practitioners, some even fresh from medical school, there may be a need to provide them with vital health information coming from trained specialists in order to better manage their patients in the community.

Given these realities, the University of the Philippines Manila - National Telehealth Center (UPM-NThC), being the "premier center for information and communications technology (ICT) applications in health" [3] in the Philippines, explored ways on how to enhance access to health information and services between remote doctors and clinical specialists. Conscious of the available resources in remote areas, the UPM-NThC utilized the Short Message Service (SMS) or "text messaging" so that general practitioners in these rural communities can refer problematic cases to domain experts (DE) from the University of the Philippines – Philippine General Hospital (UP-PGH). Key to this program is the delivery of specialized health information that may translate to better patient care.

Review of literature

Short Message Service (SMS)

SMS, or text messaging, is a communications protocol that allows users to send and receive short text messages using mobile devices such as cellular phones, smartphones or personal digital assistant (PDA) [4,5]. The message can be composed of a combination of alphanumeric characters that form words or meaningful truncation of words. However, SMS has a limitation of being able to transmit only a maximum of 160 characters, including spaces [6].

SMS delivers messages in a store and forward manner, essentially similar to paging. Instead of being sent directly to the receiving mobile device, a text message is temporarily stored in a central short message center (SMC), which then forwards the message to the intended recipient. This is useful since a message can still be received at a later time even if the recipient phone is turned off or out of coverage during the time of sending [5,6].

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The intense development and widespread use of SMS worldwide has broadened the possible applications of this service. From a simple medium that can convey short communications between two or more persons, SMS is used nowadays for information dissemination services (i.e. news, weather, stock market, and entertainment), mobile banking, internet/email notifications, mobile chatting, and even catechism [5,6,7].

Despite the limitations of size and a not so easy input mechanism through the phone keypad, SMS is still a very popular technology that has a lot of promising applications that are waiting to be developed and deployed.

Text Messaging and the Philippines

Text messaging in the Philippines has been phenomenal and its use is exponentially increasing over the years [8]. “Filipino cell phone users have truly developed a culture of texting after the Philippines retained its title as the ‘text- messaging-capital-of-the-world’ - sending a remarkable 1.39 billion text messages from a subscriber base of just 50 million [9].”

The appeal of the SMS technology to Filipinos may be attributed to the economic state of most mobile phone users. In the Philippines, a text message would cost only Php 1.00 (approximately US$0.02) while a 1-minute prepaid voice call costs around Php 8.00 (approximately US$0.16). Because of this, “more than 90 per cent of the country’s thirty-five million subscribers” resort to SMS as a primary means of communicating with others. It is estimated that a subscriber sends about seven text messages per day. [10]

Historically, text messaging was a free service from its inception in 1994 until 2000 [9]. Despite the current low rate of a mere peso for every text message, mobile networks devise promotional offers wherein subscribers will only spend Php 30.00 (approximately US$0.62) to be able to send unlimited text messages for one to two days. Due to the affordability of text messaging, “the Philippines has become the first country in the world where mobile users spend more on data services than on voice, according to a leading research company [11].”

SMS and Health

The widespread use of text messaging in various financial and entertainment applications triggered the health care community to take advantage of this technology for health services delivery. In recent years, various SMS applications for health have been utilized both by health practitioners and their patients.

Most SMS health applications focus on health information dissemination. In England, text message reminders are sent to women to prompt them to take their oral contraceptive pills. A SMS reminder system for AIDS patients in Australia was shown to improve patient compliance to the complex combination of drugs. Supportive text messages that supplement smoking cessation programs in New Zealand were found to be valuable in encouraging smokers to quit. Finally, the Health Department of San Francisco, California use text messaging to disseminate sexual-health information to adolescents and young adults. [12,13]

Despite the potential applications of text messaging in health, there are some instances wherein it may not be a suitable medium for delivering messages, such as when disclosing to a patient a critical diagnosis like cancer or AIDS [12]. In these cases, a face to face encounter with the patient is the most appropriate and ethical way of conveying the message.

Methodology

Program Coverage

The SMS Telemedicine Program was formally launched last 15 October 2007 through a Memorandum of Agreement signed between the UPM-NThC and the DOH during the Continuing Medical Education (CME) Conference of the DttB Program at Cagayan de Oro City, Philippines. A total of 34 DttBs from various remote villages of the Philippines participated in this program. The DttBs were asked to sign an agreement that the information which they will receive are opinions of the DEs and that the final diagnosis and management for the patient shall remain their responsibility. To remove the financial barrier for these doctors, the UPM-NThC gave each doctor a monthly Php100.00 (approximately US$2.00) credit load in order to refer their cases to the Center.

The doctors were encouraged to refer at least one case per week regarding any domain. The Center gave them the option to send their clinical referrals via text message to any of the two network mobile numbers (Globe and Smart). In instances where they do not have any problematic cases to refer, they were asked to send a census of all the cases they saw during the previous week. Only non-emergency cases were to be accepted since the Center can only guarantee a turn-around time of up to 48 hours.

During the May 2008 CME Conference of the DttBs, an additional 21 doctors signed up, making a total of 55 DttBs included in the pilot program.

Central Operations Procedure

The SMS Telemedicine Program is managed by a Telehealth Physician, two Telehealth Nurses, and seventeen DEs from various specialties.

The text messages were received by the Telehealth Nurses who triaged the cases to the appropriate DEs. In cases where they have difficulty in classifying the referral, they elevate it to the Telehealth Physician. The text messages were sent to the DEs through the modality that they chose. Some preferred to receive text messages through their cellular phones, while others opted to receive an email containing all the referrals for the day. All the DEs were alerted via SMS for any incoming referrals addressed to them. Once the referrals were answered by the DEs, the Telehealth Nurse forwarded the replies to the inquiring DttB.

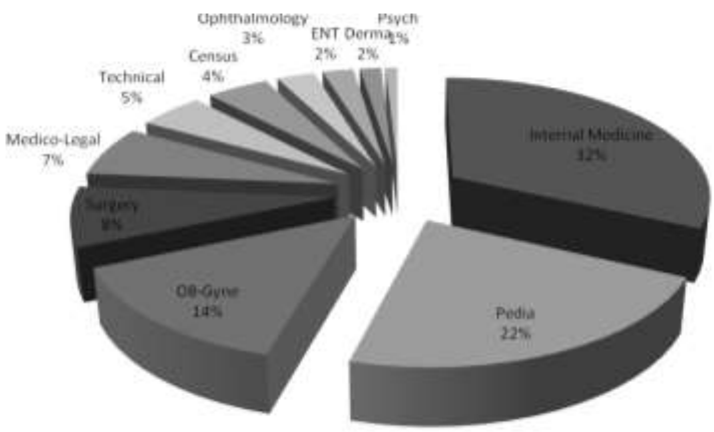
Technological Aspect

Initially, the Center used two SMS-capable cellular phones to receive the text messages. The Telehealth Nurses manually encoded the referrals from the phones to a spreadsheet database. All SMS transactions (receiving from the DttB, sending to the DE, and vice versa) were done using the two mobile phones. After two months of this process, the SIM cards were then connected to a GSM modem so that incoming text messages were readily available in a computer interface. The Center utilized playSMS, "a flexible Web-based mobile portal system" [14], to manage all the incoming and outgoing SMS transactions. The shift in the technology to automate the various transactions improved the workflow and minimized the possible errors in encoding.

Results

Over a period of one year (15 October 2007 to 15 October 2008), UPM-NThC received a total of 577 telehealth referrals via SMS. Among domains, Internal Medicine had the most referrals (185) followed by Pediatrics (128). Other referrals were from: Obstetrics and Gynecology (82), Surgery (46), Medico-Legal (39), Technical procedure questions (28), Census reports (26), Ophthalmology (16), Otorhinolaryngology (11), Dermatology (9), and Psychiatry (1). Figure 1 shows the distribution of referrals by domain.

Figure 1: Total SMS Referrals from 15 October 2007 to 15 October 2008 (n=577).



The UPM-NThC was able to respond to 518 out of the 577 referrals, yielding a response rate of 89.77%. Of the 59 unanswered referrals, majority were Medico-legal (15) and Internal Medicine (14) cases.

Discussion

The geographic configuration of the Philippines, being an archipelago of 7,107 islands, has made it impossible to physically station a medical practitioner in all its municipalities. Furthermore, the handful of doctors deployed in rural villages may lack certain clinical expertise in order to resolve problematic cases in the field. These general practitioners may need the assistance of a trained specialist who on the other hand, usually practices in urban areas.

With the availability of the SMS technology across the country, reaching even the far-flung regions, the geographic barrier to dissemination of specialized health information has been removed. Exchange of data between a central health facility and a remote village doctor is now possible and even crucial to the management of patients in the rural setting.

The familiarity of rural doctors with the use of cellular phones makes it a better communication tool compared to Internet-based solutions. The accessibility of SMS at the point of care, as well as its economical rates adds to its advantages of being used in the rural setting.

In this program, DttBs made use of SMS to refer the challenging cases that they encountered in the community. Despite the 160-character limitation of the SMS technology, the ability of most cellular phones to compose multiple short messages into one message made it possible for the referring doctor to provide more clinical information for review by the DE. However, for earlier models of cellular phones without such capability, the character limitation may pose some difficulties in sending and retrieving lengthy messages.

The limitations in allowable characters of a text message was further shun from through the use of a text vocabulary or ‘text speak’ [13]. This made use of truncated or abbreviated words to keep the messages brief and concise. It is worth mentioning that despite the use of such language, the DEs were still able to understand the intended message of the DttBs.

Based on the domain analysis of the telehealth referrals, the DttBs referred mostly Internal Medicine and Pediatrics cases probably since majority of the outpatient consults in the provinces are in the domains of general adult and child medicine. In most cases, the health information given by experts helped the rural physician in managing the case.

The UPM-NThC was able to answer 89.77% of all the referrals received. The unavailability of some DEs during a few periods of time made it difficult to answer the cases within the allotted time frame. Furthermore, since the University does not have a full-time Medicolegal Expert, a number of medicolegal referrals remained unanswered. In certain instances, the referrals were forwarded to agencies outside the University.

Conclusion

SMS seems to be a viable telemedicine application in the Philippine setting due to its accessibility, availability, affordability and mobility. There is a need to support village doctors who are frontliners in the remote communities of the country. The extensive use of cellular phones and SMS technology nationwide provide a lifelink for general practitioners to refer their challenging cases to a specialist.

There is a need to assess the satisfaction of both the remote doctors and DEs with regards to the implementation of the SMS Telemedicine Program so that modifications can be done to improve the service for both stakeholders. Aware of the great potentials of SMS as an application for health, there is a need to develop standards and guidelines for this emerging field.

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Annex 7

Thailand: Next-Generation Healthcare

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Bumrungrad International Hospital

Bumrungrad International is the largest private hospital in Southeast Asiaand one of the world's most popular destinations for medical tourism. It offers state-of-the-art diagnostic, therapeutic and intensive care facilities in a multi-specialty medical center located in Bangkok, Thailand. Opened in 1980, the hospital was Asia's first to pass the demanding review of the Joint Commission International, the highest US standard for hospital accreditation. Newsweek recently included Bumrungrad on its list of 10 leading international hospitals, calling it "one of the most modern and efficient medical facilities in the world."

The challenge: Real-Time access to patient information and improving hospital staff efficiency and response time

Over a million patients are provided patient-care facilities annually at Thailand's Bumrungrad International hospital, across its 90,000 m2 campus. The hospital staff needs to have up-to-the minute information about the patients, medical records and medication schedules, regardless of where they are working across the campus.

Being the largest private hospital in Southeast Asia, Bumrungrad has built a strong reputation as a leading medical tourism destination providing world-class healthcare service to its patients. "Bumrungrad's long-term vision is to provide information and internet access to every patient throughout the hospital. Hospital staff must have access to real-time patient information which enables them to provide improved healthcare services and advice to their patients," said Mr. Chang Foo, Chief Technology Officer of Bumrungrad International.

Another key challenge was to have a robust system that maintains the confidentiality and security of patient information across the network.

The solution: Implementation of a state-of-the-art wireless infrastructure

Bumrungrad initiated implementation of a state-of-the-art wireless infrastructure project that will provide the backbone for delivering world-class healthcare services to its patients. Bumrungrad selected an enterprise mobility solution that includes wireless switching and over 300 access points.

Hospital staff will be equipped with mobile computing devices through which they can access hospital information and patient records on Hospital 2000, Bumrungrad's hospital information management system provided by Global Care Solutions.

The network topology will include wireless switch as the core backbone. By allowing mobile users to maintain a persistent connection to high-bandwidth applications as they roam throughout the wireless coverage area, the switch will provide the foundation for Bumrungrad's long term vision to expand and deploy other WiFi services both indoors and outdoors.

Bumrungrad plans to upgrade the core switching platform to the Wireless Next Generation Switch which is the industry's first radio frequency (RF) wireless switch that bridges the gap between Wi-Fi, RFID and other key RF technologies, and is designed to support value-add, optional add-on modules such as fixed-mobile convergence to provide seamless persistent connectivity for mobile and fixed devices.

Furthermore, to ensure patient information remains confidential and known only to authorized personnel, the wireless network is also protected. The system will notify Bumrungrad's IT staff when network vulnerabilities or attacks occur, enabling an immediate response. The software architecture is scalable, simple to deploy and easy to upgrade.

Bumrungrad plans to take its vision of next-generation healthcare one step further through the implementation of RFID technology for staff, patient and asset tracking.

The benefits: Improve the quality and efficiency of patient care, helping to reduce risk and save lives

The solution allowed the hospital staff to access real-time information and data messaging capabilities while on the hospital's 90,000 m2 campus. It allowed the medical staff to review patients' medical histories, update patient information, check for drug interactions, and look at lab results and x-rays — all from the point of activity: the bedside, the front office, in surgery or on the go.

The patients could also enjoy seamless mobility across the campus. The wireless network will also enable Bumrungrad's long-term vision to provide information and internet access to every patient throughout the hospital.

The solution is also designed for scalability and will allow Bumrungrad Hospital to deploy Wi-Fi and RFID services through one switching platform. This will reduce the total cost of ownership and simplify management of multiple wireless infrastructure technologies.

Annex 8

Russia: Mobile Telemedicine – Solutions for Russian Vast Territories

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Introduction

Long-term experience of adoption and development of telemedicine technologies in Health Service practice of Russia with its vast territories that have different level of development and organizational resources of qualified health care delivery gives the opportunity to authors to suggest their own view of practical projects realization within the bounds of conception of World Health Organization (WHO) "Health for everybody": "…when innovative telemedicine technologies become the instrument for providing of available aid of the best doctors to any citizen of the farthest regions of the country and the world, and it gives to general practitioners the access to advanced training at the best specialists of the country (the world), even if they have no opportunity to leave that far away region of their professional activity"[1, 5].

We have to mention, that besides historic hard-to-reach areas where people are void of access to the latest advances in medicine, the needs of modern economy produce new islands of high-risk - offshore drilling platforms and camp of oil and gas industry workers in Polar Regions and in deserts, where the health and safety of specialists who temporarily go to these objects, have to be under special supervision, and today's technologies of telemedicine on the basis of videoconference communication system make it possible to solve these problems on the new level. Telemedicine technologies let us to open, for given category of specialists through satellite communication, the remote access to modern medical resources and services including international resources and services. Meanwhile considerably increases the safety of people who are far from stationary medical aid, the possibility to receive competent medical consultations promptly appears.

Mobile Solutions for Telemedicine-First Steps

The beginning of active work in the realization of telemedicine projects is closely connected with the availability of fast-acting channels of communication that can cast big scope of static information, for example X-ray photographs and also wideband dynamic signals - television signals and analogous.

The practice proves that if there is a usual telephone channel with bandwidth of 64 kilobit per second, or lower-bit-rate Internet with the same bandwidth in a village hospital, then it is possible to start telemedicine project giving the opportunity to consult on the base of beforehand transferred static information that is prepared with the help of scanner, documentary camera and photographic camera. Transferred through this channel of communication medical information is quite enough for urgent consultation or prior subspecialty consultation that gave the opportunity not only to consult thousand of patients but also to reduce costs for such help considerably. Publications of our foreign colleagues in applied problems of telemedicine use in different spheres of modern medicine confirm the given conclusion of Russian specialists. [2, 3].

As soon as the possibility of wideband communication channels use (such as high-speed Internet or channels like ISDN that provide change of information between consultant and consulting person with the speed higher then 128 kilobit per second) becomes available, the telemedicine project rises to the new level when in a real-time mode practically all existing tool methods of patients diagnostics becomes accessible

Experience of organization of mobile telemedicine units shows that at the current rates of development and improvement of digital diagnostic units it is rather hard to predict how soon the whole set of the existing devices will be affordable for any clinic with a lean budget. Whatever seems fantastic today, tomorrow may prove to be outdated.

By the very end of 1990s, the industry offered to the market videoconferencing mobile units (the so-called “yellow suitcases”). This equipment allowed physicians from the mobile emergency medicine units to get in touch with consultants at diagnostic centers right from the site of accident or disaster, demonstrating the patients via AudioVideo (AV) channels and feeding audio data on examination results acquired with the help of a standard set of devices, which physicians brought to the disaster area. Despite insignificant (by modern standards) volume of data provided this way, it allowed to reduce the losses among patients at the cost of increasing the quality of solutions and prioritizing the emergency aid to the big groups of patients. Looking back now, one should consider it as a huge step ahead [3, 4].

Modern Mobile Solutions for Telemedicine

Modern mobile telemedicine complexes are specialized portable systems that provide remote medical consulting, execution of basic diagnostic examinations, as well as urgent, computer processing and data transfer for consultation. These complexes use telecommunication as well as satellite for address exchange of medical information between diagnostic specialists and give the opportunity to doctors and patients to have remote access to modern medical resources and services including international resources and services practically from any place of the planet.

Technical decision for mobile telemedicine complex provided by Russian specialist includes:

- Module of data processing and videocommunications.
- Informational and diagnostic module for urgent medicine.
- Module for connection with satellite or mobile communications.
- Module for protection and biometric identification.

Approximate architecture of the decision (one of possible variants) is shown on figure 1.

Module of data processing and transfer of videoinformation includes personal portative computer (laptop) with a screen and installed medical software and portative system of video conferencing for videoinformation transfer (teleconsulting). Both systems are connected through digital interface and have possibility for connection to wire communication (ISDN or IP). Computer has programs of input, processing and storage of images, ECG curve, and also the program of database with patients’ notes maintenance.

Laptop has the full complement of interfaces for external device connection, and also controllers Bluetooth and WiFi for external connection.Hardware system complex of videoconference as polyethylene waterproof case with integrated videocode, built-in camera, LCD screen, microphone, loudspeakers, headset with a microphone, control console and power module.

This decision integrates the best Russian and foreign decisions and guaranty simultaneous connection of 4 video and 3 audio abonents, transmission speed up to 384 kilobit per second – 2 megabit per second through ISDN channels or 768 kilobit per second – 3 megabit per second through protocol IP, protocols H.323, H.320 and SIP.

Distinctive feature of mobile telemedicine complex is existence of informational and diagnostic module for urgent medicine that gives possibility to implement express-monitoring of patients condition and data transfer for consultations and hospital preparation for the reception of patients. The Module includes different medical equipment that is possible to connect to digital interface to other modules of the complex. It consists of diagnostic system of functional diagnostics doctor. This system includes electrocardiograph, spirograph, and phonocardiograph. Besides, the module is completed with glucometer/ cholesterolmeter for measure of blood sugar and blood cholesterol, measuring instrument for blood pressure and extra laboratory equipment. The content of the module can also differ depending on demands.

If this complex is also used for express-examination, it following devices can be connected to it extra:

- Ultrasonic portable scanner;
- Electrocardiogram plus spirometric sensor;

- Haematological analyzer (about 20 characteristics);
- Portable urine analyzer;
- Mobile X-ray apparatus (in the suitcase);
- Without X-rays microanalyser of general blood bilirubin;
- Complex for dermatoglyphics examination.

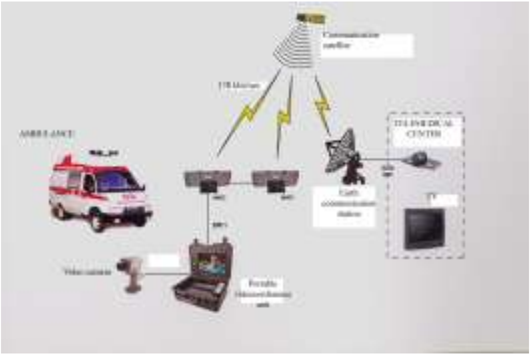
The content of informational and diagnostic module can be changed that is there are separate kitting for diagnostic of heart and circulatory system, the system can be changed or added kitting of daily patients monitoring, neurologic equipment [4, 6].

To the content of the complex the module for connection with different channels of communication and biometrical control system and system of access control for securing of equipment and information from unauthorized use.

Mobile telemedicine complex can be hand transported in the forests, fields, tundra and also it is established on special off-highway vehicle that serves polar nomad camp of reindeer breeder (Fig.2-3).

Figure 1, 2 & 3

Approximate architecture of the decision for mobile telemedicine complex



Mobile telemedicine complex: Teleconsultation at the reindeer-breeder stop on the Arctic ocean coast (Russian tundra zone)

Mobile telemedicine complex in tundra (transported by special cross-country vehicle)

Similar system on the base of Mercedes Sprinter cars (resuscitation ambulance) was adapted to the departmental system of health care of “Rossiyskie zheleznye dorogi” Ltd. (Russian railways) (Fig.4). Similar system is functioning in five medical special trains (movable diagnostic centers), named after well-known Russian specialists: physician “Matvey Mudrov”, surgeon “Nikolay Pirogov”, and so on, that work in northwest, south and in the Far East of the Russia. The cost of medical equipment installed in each train is close to € 2,500,000 (Fig.5-6).

Figure 4, 5 & 6

Ambulance (during teleconsultation)

Hospital train (outward) JSC Russian railways has now five hospital trains (modern Mobile diagnostic centers with teleconsultation center in the compartment and satellite antenna on the roof)

Hospital train (teleconsultation center in the compartment)

According to a newspaper printed in the Far East, each train "…consists of nine cars: No. 1 – diesel generator car with a constant voltage regulator to feed digital medical equipment and computers; No. 2 – X-ray car; five diagnostic and treatment cars housing offices of a cardiologist, professional pathologist, ENT specialist, endoscopy and colonoscopy room, sterilization room, and two administration cars. Special attention should be paid to the functional diagnostics car. In addition to offices of a neurologist, neuro-physiologist and psycho-physiologist, it has a telemedicine office. It has a satellite communications system for videoconferences and consulting with experts of the relevant regional hospital and the leading national clinics. On January 25, 2006 test teleconference bridge successfully connected the medical train to Strasbourg where O.Y. Atkov, Vice-President of the OJSC "Russian Railways", President of the Russian Telemedicine Association, Astronaut, M.D., lectured about the opportunities of telemedicine. Satellite communication with Khabarovsk served as a demonstration… In fact, not every clinic in Khabarovsk can boast the same hardware as this train. It is not a polyclinic on wheels as some journalists dubbed it. It is a fully functional mobile clinical diagnostic center. Overall staff of the train is 55 persons…"

For Russia with its territory covering ten time zones, emergence of mobile clinics and clinical diagnostic centers means an important stage of national projects in the sphere of health care system, which serve to equalize quality medical services all around this huge country.

All this hereinbefore mentioned solutions are not cheap and can not be recommended for almost 50000 medical stations where frequently alone nurses work in small remote villages.

But formation of telemedicine consulting and training system for this class of medial units will ensure solution of the most vital social and economic objectives for those rural inhabitants - make sure that the best physicians are readily available to assist every resident of the most remote regions of Russia. Now inhabitants of remote villages can get qualified help only if they have visit district or regional hospital – average distance in East regions of Russia about two – three hundred kilometers or even more.

The situation can be change-over if the work of each medical station will be organized on the basis of digital platform (not very expensive) and minimal set different medical equipment that are possible to connect to digital interface of the platform.

Modern Russian mobile complex (Prototype on the bases of notebook see Fig.7) gives as a good sample of such equipment. These complexes use telecommunication as well as satellite for address exchange of medical information. It includes the above mentioned diagnostic system of functional diagnostics doctor. So such mobile complex includes the set of diagnostic equipment that is beyond the dreams of the municipal medical station now.

Figure 7: Inexpensive mobile telemedicine unit (in compare with standard equipment)

The level of the cost of such equipment will be equal the price of notebook. That is why creation of cheap mobile telemedicine complexes appeared to be a natural extension of previously performed work. It means that the system of telemedicine consulting centers evolved into a major factor enhancing the quality medical aid in remote districts of Russia.

As we can see modern mobile telemedicine unit, in addition to videoconferencing facilities, comprises of digital diagnostic units capable of transmitting to the consultant a fairly big volume of measurement data in the course of examination and it should be noted that functionality of this unit tends to expand [6].

Summary

Decade of development of telemedicine projects in rural regions allows for a number of optimistic conclusions, including the one that Russia has laid foundation for its national telemedicine network based on innovative technologies, which will define scientific and engineering development of any country caring for health of its citizens.

The task for the nearest future is to expand the use of telemedicine technologies by physicians in all regions of Russia without exception, as well as to support the emergency medicine personnel, render assistance to residents of remote settlements and detached communities (vessels, offshore drilling rigs, etc.).

According to this analysis, experience of the national telemedicine may be vastly used in the course of profound technical upgrading of medical institutions in the regions and communities, as well as during the creation of integrated system to ensure quality medical assistance to the citizens of each country, based on the approved innovative mobile telemedicine technologies. This will ensure substantially more efficient and economically feasible use of budgetary assets.

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Annex 9

USA: The Role of Telemedicine in Long Term Care Facilities

J. DiMartino [1], M. Mullen-Fortino[1], F. Sites [2], J. Galen [2], M. Soisson [2] M.J. Ricci [2]

Introduction

Long Term Acute Care Hospitals (LTACH) have the ability to provide care to medically complex patients. However, LTACH's are faced with many of the same challenges that exist internationally with the decreased supply and high demand for Intensivist's and the nursing shortage [1]-[2]. An e-ICU® program provided an opportunity to optimize the clinical arena with telemedicine as the practical solution for an LTACH population. Integrating the e-ICU® program into the LTACH presented several benefits as well as unique challenges.

e-ICU®

Historically telemedicine has been used in a variety of ways to offer support, medical consults, and to provide a continuum of care for patients and medical staff. Once such use of telemedicine is the eICU® which is a safeguard or an additional layer of protection for Intensive Care Units (ICU). The e-ICU® concept was originally developed to combat the Intensivist physician shortage in ICU's but has been adopted in other care environments such as Post Anesthesia Care Units (PACU), LTACH's, and Emergency [3-5].

The e-ICU's® is emerging as a viable solution to aid in safety and quality of care for intensive care patients. An eICU® telemedicine system allows physicians and nurses to closely monitor patients from a remote location. The e-ICU's® use data streams from physiologic systems, ancillary systems, intelligent decision support and data mining tools integrated with an electronic medical record to permit coverage of large numbers of geographically remote patients from a central physical location. The technology leverages nurses and Intensivist's around a designated set of work hours strategically defined to support hospitals during hours of vulnerability [3]. These intelligent technologies channel critical care and hemodynamic data to the appropriate clinicians at the appropriate time to proactively impact patient care. The immediate benefit to using this innovative and effective technology is that critical care units are improving patient care in the face of an increasing Intensivist and nursing shortages [1]-[2].

The e-ICU® has the distinct advantage much like that of a panoptical where the flow of historic and real time data continually flows. The ability to have data and patient information centrally located through the eICU's® electronic data system, coupled with interfaces allows physicians and nurses to intelligently intercede for the patients benefit using smart alert systems [4]. The benefit of transparent data flow allows for the entire care team, whether physically located on site or remotely, to improve communications that positively impact on the patients care [3].

Long Term Acute Care

LTACH's evolved in the 1980s in response to an increased demand for ICU beds and an inability or lack of step down units to care for these patient populations. There are approximately 385 LTACH's in the United States [6]-[7]. Typical conditions or diagnoses for LTACH admission include but are not limited to ventilator weaning, skin ulcers or wounds, long-term antibiotic therapy, and stable but complex medical conditions. Historically these patients's are ICU outliers with an increased length of stay. Medicare rules for LTACH's

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indicate that the average length of stay must be greater than 25 days [6]-[7]. Acute care facilities often do not have the multidisciplinary teams and resources to optimally provide care for these types of patients whereas in an LTACH resources are optimized.

Challenges in LTACH

Some of the most pressing challenges impacting patient care aside from the above mentioned human factor shortages is ensuring the transparency of data flow, it was reported [3] that the eICU® impacted positively on decreasing patient length of stay and infection rates. Decrease in these measures increases the return on investment in an ICU setting but these outcome measures remain to be seen in the LTACH environment. One documented eICU® impact on the LTACH has been the ability of the eICU® to provide oversight in the management of patients without needlessly transporting patients to a higher level of care. LTACH's operate under stringent guidelines around patient length of stay that impact payment structures to the LTACH's. The financial implications to send a patient to a higher level of care has a significant impact on the return on investment compared to the costs to institute an Intensivist led telemedicine program that can effectively manage patients within the LTACH structure [6]- [7].

A number of approaches have been employed to combat the Intensivist shortage. To date, efforts to decrease the Intensivist shortage, primarily with ICU support in mind, has lost ground in terms of supply and demand with some estimates indicate a 48% shortage by the year 2020 [1]- [2]. This reduction in physician workforce has allowed for one such LTACH to creatively utilize the eICU® telemedicine services and institute teleconsulting as a means to provide consultation for the unit's medically complex patients.

Another challenge within the LTACH was how the e-ICU could have an impact on the patients that were not being monitored. The e-Care Mobile® is a state portable electronic telemedicine device. It enables the e-ICU to provide expert medical care and nursing support to critically ill or deteriorating patients. The device is brought to the patient's bedside during all rapid response calls as a critical part of the care the response team. The device can be used to provide supervision or consultation by the providers in the e-ICU. In addition, the device has been placed into patients rooms that are confused or agitated to provide supervision.

Benefits of Integrating an e-ICU® Program in an LTACH

Integrating an eICU into a LTACH enhances a culture of safety within the hospital. Clinicians in the Clinical Operations Room (COR) track compliance with evidence based practice for stress ulcers, ventilator bundle, sepsis bundle, low tidal volume ventilation, deep vein thrombosis prophylaxis, transfusions parameters, glycemic control and beta blocker usage. Processing large volumes of information in real time allows both the eICU® clinicians located in the COR and bedside clinicians to identify harmful trends in a patients' status. Recommendations are made by the critical care nurse or the Intensivist in the COR to the bedside nurse that initiates a proactive intervention. The COR team may be consulted by the bedside nurse or a hospitalist to discuss any complex LTACH patient from the room or in a designated consult area. The LTACH is meeting or exceeding national benchmarks in infections rates, falls, and response to alarms.

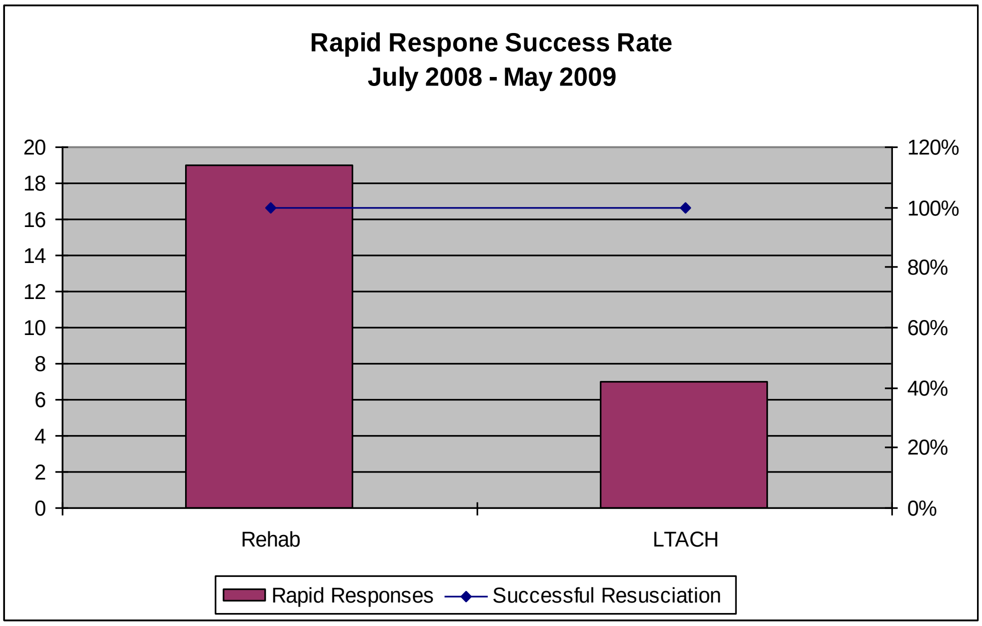
A mobile e-ICU® unit was integrated into the hospitals' Rapid Response Team (RRT). The e-ICU® mobile unit is used with all patients housed in the building and not a part of the LTACH. Patient rooms throughout the building can be connected via a landline port to the eICU® mobile unit allowing other patients access to the clinical expertise of the Intensives and critical care nurses working in the COR. Safety promotion, service excellence and evidence based practice were deciding factors in developing this model of care.

Hospitalists and a Critical Care Pulmonologist cover the LTACH seven days a week during the day for twelve hour shifts while night time coverage is provided by the e-ICU® Intensivist. Research demonstrates the strength of the Intensivist model in optimizing and improving patient outcomes [1]-[2].

Consults with a specialist or the patient's primary physician using the eICU® mobile unit in a patient's room promotes communication across the healthcare continuum. The consultant or primary care physician at the acute care hospital or from their personal computer can communicate with the patient by way of a bidirectional AV feed and patient's can converse and see the consultant. Physicians across the health system have the ability to follow a patient from preadmission, hospitalization, discharge and rehabilitation which increased patient, family and physician satisfaction.

The benefits of these innovative pieces of technology to the LTACH impact both the patient and the staff. The LTACH and rehab units have a 100% success resuscitation rate in all rapid response. These devices have also led to high staff satisfaction due to the additional support systems created. The graph of rapid response success rate is given below in figure 1

Figure 1:



Comment

A night time Intensivist model of care is not feasible for most LTACH's due to scarcity of the resource and expense of this care model. However, this LTACH found this model cost effective because of the reduction of inappropriate transfers, improved outcomes, healthcare providers, and patient/family satisfaction. The e-ICU® model of care in a LTACH is a viable solution that can provide a second layer of protection during the day while protecting the patient's during the most vulnerable time period at night. An e-ICU® can assist a LTACH in ensuring safety standards, service excellence while maintaining research based practices and processes.

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