

当今美国医疗建筑发展的十大趋势

Ten Current Trends in American Healthcare Architecture

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[摘要] 当前美国医疗建筑行业正处于一个充满不确定性的时期,即将于2014年全面生效的全国医改法案可能会带来难以预料的结果。很多医院和诊所将会面对新病人数量激增,而另外一些医疗机构将极有可能面对相反的状况。本文即探讨当前对服务于门诊以及住院病人的美国医疗设施基础建设产生重要影响的十大趋势。

[关键词] 当前趋势 医疗建筑 可持续性 生态化设计 美国

[Abstract] Healthcare architecture in the United States is currently experiencing a period of considerable uncertainty. National healthcare reform legislation, to take full effect in 2014, will have certain unforeseen consequences. Many hospitals and clinics will see a surge in new patients while others will in a likelihood see a decline. Ten trends are outlined that are currently shaping the nation's infrastructure of healthcare facilities for inpatient and outpatient populations.

[Key words] Current trends, Healthcare facilities, Sustainability, Ecological design, United States

美国医疗行业的转变已经是一个不争的事实。持续增长的人口数量给全美的医疗基础设施的建设带来新的压力。在各种不确定性下,许多医院和医疗机构,特别是私营机构将面临对现有设施进行改造、扩建或者建造全新设施的选择。这种不确定性大部分来自于即将实施的全国医改法案对医疗行业造成的冲击。最近通过的新的联邦法——《2010年联邦卫生保健法案》(Health Care Act of 2010)即将于2014年全面实施。无论是营利性机构还是政府医疗机构都对这一新法案会引发的结果充满不确定。会导致新获得保险的病人涌入医疗系统,对现有医疗设施带来过度压力吗?这些新法受益病人会被不均匀地从公有医疗设施重新分配到私有医疗设施,还是相反的情况?到2014年,将有超过3100万美国人获得至少最低等级的医疗保险,而目前还有超过4800万美国人没有任何形式的医疗保险,面对这样的大环境,尝试对2014年后的变化做出各种精确的预测都将是一种挑战。以下是2012年正在美国医疗建筑行业发生的十项变化。

一、现代主义风格医院、诊所的消失

数以百计建于20世纪中期的现代主义风格的美国医院已经被拆除或者正面临被拆除的威胁,遗憾的是,并没有全国性的数据持续关注这一趋势。那些已经使用超过50年的医院、诊所和疗养院正在被拆毁,新的医疗设施被大量建造用以更替旧址。然而同一时期,人们开始多从生态资源保护的角度考虑那些曾被轻易认为功能滞后、年份久远的现代主义医疗设施能否在更新、改建后适应新的医疗模式。美国医院协会(American Hospital Association)所列出的美国现有医院总数为5754家,而到2020年将会减少10%到5179家左右。2010年全国新建成医疗设施的总造价为625亿美元,翻新项目总造价298亿美元。经过对新建工程的研究发现,医院工程数量总计比其他医疗建筑类型要多22%。未来3年内,将增加23%的急诊科,20%的影像部分,外科手术部门也将有15%的新建设量。

一个令人遗憾的案例是,新奥尔良卡特里娜飓风(Hurricane Katrina)后,在历史保护者和医院管理层之间出现了一场为挽救当地历史悠久的慈善

医院的激烈斗争。路易斯安那州立大学健康科学中心(LSUHSC)决定弃用位于城市中心商务区、建于1938年、带有装饰主义风格的900床的老医院,而在旧址旁建造一个全新的340床的医院。医院官方声称这座建于1938年、备受民众喜爱的当地标志性设施在卡特里娜飓风的洪水中遭到了不可修复的破坏,虽然证实并非如此,然而2006年路易斯安那州历史保护基金会收到60万美元的捐款,被委任对这座历史遗迹的修复进行可行性研究,以确定其能否重新投入使用。位于费城的RMJM Hiller建筑设计公司主持了这次可行性研究,在其于2006年年中提交的长达200页的报告中论述了如何能让慈善医院比以前更好地运行而只需要花费LSUHSC提议的在四个街区之外重建新医院一半造价的方案。这场围绕着这座医院命运的颇有争议的公共辩论在之后的一年中从未间断,重建新医院的主张一直压倒着历史保护主义者的声音。最终,来自西雅图的NBBJ建筑事务所设计的新医院将于2014年建成并对外开放。虽然重新使用老医院应该可以在LEED认证医院项目的要求下实现远低于新建工程造价,同时实现保护城市的历史价值,但事实未能如愿,这座建于20世纪中期的现代的医院将被废置。这次溃败意味着城市失去了一次在文化史和建筑史上实现价值保护的机会,失去了这个被新奥尔良几代人喜爱的公众标志^①。

二、门诊设施日渐增长的需求

1983年后,随着“税收公平和财政责任法”(Tax Equity and Fiscal Responsibility Act, TEFRA)和“诊断相关组”(diagnosis-related group, DRG)医疗改革法案的制定,美国医院开始从昂贵的住院治疗向相对低廉的门诊护理和治疗的模式转变,门诊医疗设施得到快速发展。转型目的旨在建立可行的、以预防为主的诊断和治疗方法,同时显著减少住院时间(average length of inpatient stay, ALOS)。自1983年大幅度调整以后,全美范围内的住院平均时长急速下降。在向门诊服务转变进程中,一系列全新的独立社区诊所涌现出来。大多数这样的诊所单层楼房总面积不超过10000平方英尺(929m²)。很多散布于城郊社区内。2008年以来美国经济的

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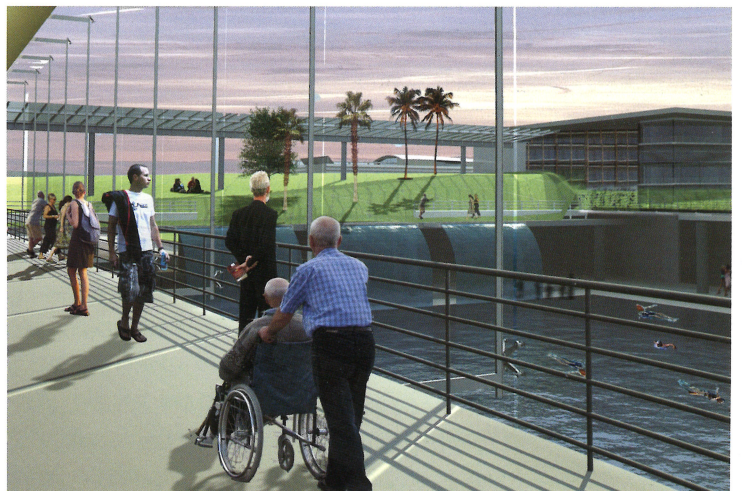
1 纳什维尔市范德比尔特医疗公司开发的“百年橡树”项目 (One Hundred Oaks, 图片来源: Bob Schatz/Gresham, Smith and Partners)



2 改造后的“百年橡树”项目室内场景 (Interior of the rebuilt mall, 图片来源: Bob Schatz/Gresham, Smith and Partners)



3 2010 年位于新奥尔良郊区的 Gentilly Commons 社区重新开发项目 (Therapeutic garden, 图片来源: Stephen Verderber)



4 Gentilly Commons 社区重新开发后的疗养温泉和水池 (Spa/wellness center, 图片来源: Stephen Verderber)

低靡导致很多购物中心和商业店铺空置, 这些“停业中”的购物商场已被证明非常适合改造成门诊式服务设施。

1968 年建成的“百年橡树”(One Hundred Oaks) 项目是纳什维尔市第一个封闭式购物中心, 距离最繁华的中央商业区和范德比尔特大学(Vanderbilt University) 只有几英里路程(图 1)。购物中心坐落在 56 英亩(22.7hm²) 的场地上, 拥有 88 万平方英尺(8.2 万 m²) 的购物空间和 4 000 个停车位。2005 年宣布“死亡”(即空置), 成为又一个美国经济萧条的牺牲品, 同时也影响了周边社区的经济。尽管有反对者质疑改造后的空置购物中心无法在功能上适用于医疗设施, 但是范德比尔特医疗公司的成功案例打消了此种顾虑。在 GSP 建筑设计事务所(Grasham, Smith and Partners) 的协助下, 购物中心被改造成 45 万平方英尺(4.2 万 m²) 的医疗中心并重新投入使用。目前, 22 个专科门诊以及

药房、医疗影像中心和化验室被安置在这座 LEED 认证的建筑当中; 停车场通过重新设计增强了景观布置和步行道路系统。购物中心的改造内容还包括 4.7 万平方英尺(4 400m²) 的 5 层办公楼。这些门诊和附属功能通过 800 英尺(244m) 的交通廊道连接, 室内进行了重新装修, 外饰墙面也进行了改造(图 2)。范德比尔特医疗公司百年橡树诊所项目完成于 2009 年^②, 之后十年将有更多类似购物中心改造为医疗设施的项目出现。

三、居家医疗护理模式和虚拟医疗

上个世纪的大部分时期, 医院一直是美国人接受治疗的中心场所, 大型城市医疗中心多由技术专家主导。尽管“以医院为中心”的护理模式是最昂贵的, 但病人还是几乎完全依赖在医院接受治疗。在这段时期, 医务人员成为医院不可或缺的一部分, 因而国际风格的现代医疗中心的设计首要关注的是

满足医生、专职护理者和医疗机构本身的需求, 而非病人及家属的需求。

如今, 家庭式医疗护理(home-based healthcare) 正在美国蓬勃发展。由于保险公司目前不愿支付住院治疗护理相关费用, 家庭式护理得到前所未有的重视, 既能够节省大量开支, 同时也让病人和家人仍处于熟悉的环境中, 互联网的快速发展也是“家即诊所”(home-as-clinic) 实现的加速器。计算机和便携电子设备使病人在任何地点都可以与医生保持全天候的联系。基于此, 家庭护理机构主要为病人提供临终关怀护理、康复性治疗、饮食服务和日间护理的服务。病人未来将能够在家中监控自己的身体状态。快速的科技发展也让更多的美国老年人能够独立在家生活。

远程医疗涵盖的医疗技术包括从电子病历卡到医生和病人间的电子邮件交流。双向的实况视频交流方式(如通过 Skype 软件) 能帮助实现实时咨询。

同时,越来越多的美国人开始转向从网络健康服务网站 (WEB-MD) 和其他网络保健资源上寻找信息。麻省理工大学 (MIT) 的媒体实验室正在开发可在线与病人交流并提供医疗咨询的虚拟医生和护士,在不久的将来,利用全息图投影技术 (hologram) 可使病人见到 3D 虚拟的医生和护士站在自家的卧室或厨房里。这一技术的运用能够使医疗消费者比以往获得更多的护理知识并且有更高的需求,“家即诊所”的比喻现在已延伸到住宅本身的物质属性,毕竟网络资源已使得人们在家监测环境空气质量成为可能。

四、循证研究和设计的日趋成熟

循证研究和设计 (EBR&D) 运动建立在三个假定基础之上:首先,病人应集中精力在治疗和恢复上,而不需要去浪费精力应付不合理、不友善的护理环境;其次,医疗服务人员应该在没有因日常工作而受伤罹病的情况下有效履行其职责;最后,医疗保健设施不应再继续消耗过量不可再生能源。总而言之,循证研究和设计运动旨在扭转医院医疗过失频发的现状。目前,美国每年有超过 9.8 万例患者死于医疗过失或医源性感染。为应对这一问题,一套认证和鉴定体系正在被建立,目的在于为医疗行业培养一批骨干专业人员来防止医疗过失的发生。这个名叫“循证设计认证鉴定师”(Evidence-based Design Accreditation and Certification, EDAC) 的新项目由总部设立在新泽西的罗伯特·伍德·约翰逊基金会 (Robert Wood Johnson Foundation) 提供启动资金,连同加州的医疗设计中心 (the Center for Health Design) 合作建立。这个机构在 2008 年底推出了一套 3 本的学习指南,包括《循证设计简介:深入研究医疗设计》(An Introduction to Evidence-based Design: Exploring Healthcare and Design)、《建立循证的基础:探寻医疗设计的研究方法论》(Building the Evidence Base: Understating Research in Healthcare Design)、《结合循证设计:如何在医疗设计过程中实践》(Integrating Evidence-based Design: Practicing the Healthcare Design Process),吸引了更多医生、护士、医疗管理者、建筑师和国家官员的关注,然而评论家认为这套认证体系尚不够成熟,循证研究设计数据库仍显单薄,需要更多的研究来加以验证。

“理想医院 2.0” (Fable Hospital 2.0) 项目或许是循证研究和设计最好的代表。这是一个为满足循证研究设计在医疗建筑中需求和鉴证其运用价值而策划出来的虚拟商业案例,一定程度上建立在医疗设计中心的鹅卵石项目 (Pebble Project) 研究成果基础上,即通过应用循证研究和设计方法对美国医疗设施做出的案例研究概要。“理想医院 2.0”项目的主要议题包括:提倡更大的单人病房、急性通用病房、更大的开窗面积、双开门的更大的病房卫

生间、每张病床安装顶置式病人起吊器、优质的室内空气质量以减少疾病感染、每两个相邻的病房设置一个护士站、每个病床旁设置洗手池、优化照明方案、控制各护理单元内噪音、降低能耗、关注艺术品和自然景观的重要作用、疗养花园、病人家属的专属空间、治疗全过程的数字技术应用^⑨。然而评论家却认为对于全私人病房的医院循证研究和设计案例在美国还没有被最终证明有效,因为那些能够确定适用于所有医院和患者人群的结论性经验数据还太少。由于美国全私人病房医院造价不菲,所以关于私人病房的讨论始终存在争议^⑩。

五、推进碳中和医院

在美国,医院建筑一直被视为最严重的污染源之一,因为它们产生了大量有毒废弃物却没有采取适当的补救措施清除废料。医院仅占全球建筑总量的 4%,但却消耗建筑总能耗的 8%。过去公共竞选活动中试图掩饰这一问题的做法已不再有效,现在人们可以通过应用美国环境总署 (EPA) 网站上的“能耗计算器” (energy impact calculator) 查到全美每个邮编分区的碳足迹资料。2008 年哈肯萨克大学 (Hackensack University) 医疗中心发起他们的“绿色” (greenness) 运动时,在《纽约时报》杂志上刊登了长达 8 页的广告,可见医疗机构已逐渐认识到减少碳排放量同样可以成为市场营销的热点。

LEED (Leadership in Energy and Environmental Design) 是由美国绿色建筑委员会 (USGBC) 出资赞助的评分认证体系,采用打分制来指导全美进行最好的可持续建筑设计设计和建造。作为第三方认证机构,LEED 提供了一个对相关指定的医疗设施达到最低 LEED 认证标准的评价系统。任何工程如果要达到 LEED 的四级标准 (分别为证书,银奖、金奖和白金奖) 都需要经过一系列严格的注册、文件记载和评审的过程。截至 2009 年,在美国和加拿大有 81 155 名专业人员获得 LEED 专业认证资格 (LEED-AP)。而早在 2003 年,与 LEED 相关的《医疗项目绿色设计指南》(Green Guide for Healthcare) 就已开始使用,这个紧靠主流 LEED 认证评分标准,量身为急症护理医院打造的自行认证系统发展迅速。2007 年以来,全球范围内已有 115 个国家的工程获得 GGHC 的认证,甚至超过了盛行的 LEED 建筑核心认证项目数量。2011 年 4 月,官方的 LEED 医疗认证体系开始施行。这项新评分体系基于 110 个得分点,分别是场地选址 18 分、节水 9 分、能源与大气 39 分、材料与资源 16 分、室内环境质量 18 分、创新与设计 6 分和区域优先性 4 分;证书级别认证需要至少 40 分,银奖证书需要超过 50 分,金奖证书需要至少 60 分,而白金证书则需要最少 80 分^⑪。

截至 2011 年 10 月,已有 8 391 个项目获得 LEED 认证,而其中医疗建筑仅占 298 个,不到总量

的 4%。2009 年新建于得克萨斯州奥斯丁市的戴尔儿童医疗中心 (The Dell Children's Medical Center) 成为世界上第一个获得 LEED 白金认证的医院项目。该项目的特点包括:拥有景观庭院;92% 的建筑废物被现场回收;雨水得到回收再利用;场地中的天然气涡轮机为建筑提供所有电力 (效率高于燃煤发电厂 75%);冷却和加热装置在满足所有冷却水需求的同时还转化部分为蒸汽能源;同时停车场和全部户外空间经过景观布置以求城市热岛效应的最小化^⑫。虽然有人担心 LEED 认证建筑和非 LEED 认证建筑的区分会导致社会阶层的分化,但无论如何,LEED 评分认证体系推动一个全新的建造和评价标准。今天,美国医院的建设更关注零排放设计、绿化屋顶、具备雨水回收能力的疗养花园、地热能系统、被动式太阳能设计、建筑材料的回收、毗邻公共交通网络和自行车停放设施等方面 (图 3)。

六、医院服务竞争和医疗旅游

《纽约时报》最近刊发的一篇文章重点提到许多医院因竞相为病人提供更舒适的服务设施 (如五星级用餐、昂贵的床品、洗浴间以理石装饰的豪华病房、私人厨房以及为家属留宿准备的超大沙发) 而备感压力。位于纽约的纽约长老会医院 / 维尔·康奈尔医疗中心 (New York-Presbyterian/Weill Cornell Medical Center) 建造得堪比一座超豪华酒店,凸显了全美这一急剧升温的竞争。这样的案例在美国并不是刚刚才有的,至少 1874 年在巴尔的摩建成的约翰·霍普金斯医院 (Johns Hopkins Hospital) 中就已经有了为特权阶层设立 VIP 病房先例,其中设置有手工打造的病床和梳妆台、高级摇椅、墙挂艺术品和手工编织的地毯。当然这些只是全国乃至全球各医院为争取富裕阶层病人而相互竞争的一部分体现,虽然与此同时,美国联邦政府给医院的补贴率在不断减低。更糟的是,越来越多的证据显示那些并不富裕的病人需要等待更长的时间就医,并接受完全不合格的护理^⑬。

快速发展的医疗旅游也加剧了医院间对病人群体的激烈竞争。几十年来,美国医院通过拓展国内市场之外的医疗服务营销扩大了其地理辐射范围,著名的例子有位于休斯顿的安德森癌症研究所 (M.D. Anderson Cancer Institute)、位于纽约的雪松 - 西奈医疗中心 (Cedar-Sinai Medical Center)、位于明尼苏达州罗切斯特的梅奥诊所 (Mayo Clinic)。这种模式在过去 10 年中受到了广泛的赞同并将持续,因为这的确是一种增加医院收入的好办法,许多服务市场较小、财政拮据的专科医院也开始在地区范围内对他们的服务进行市场营销。最近,著名的克里夫兰诊所 (Cleveland Clinic) 在中东的阿布扎比开设了全新的医疗中心 (由旧金山 HDR 事务所设计)。这个高调的案例开拓了通过向一个地区输出品牌以寻求在当地医疗系统获得世界一流名声的快速

发展模式。今天的病患也比历史上任何时候都更愿意不惜远途跋涉，以接受著名医疗品牌的神经、心脏病、康复性和癌症治疗。

七、批判性地域主义

1990年后现代主义风格的出现为医疗建筑的场地规划、体量构成和叙述美学开创了新的篇章。先前的国际化风格刻板地限制了医疗建筑的外观，单调的平屋顶、方盒子的形式缺少装饰，更缺少对当地建构技术和传统美学的回应。如今，新型的材料、施工技术和地域文化已是影响建筑创作的理性因素，甚至成为了美国医疗建筑设计的正式机构、建造及审美语言的决定因素。这一被称为“批判性地域主义”的思潮主要从地域、居民、地方文化的独特性中汲取灵感。

2005年由卡勒斯特莱特建筑事务所 (Kahler Slater Architects) 设计的建于密尔沃基市的大艾塔斯卡诊所 (Grand Itasca Hospital)，运用了美国建筑巨匠弗兰克·L·赖特 (Frank Lloyd Wright, 1872 ~ 1959) 在中西部大草原学校 (Midwestern Prairie School) 设计中的建筑语言，以延伸的悬挑构件、干挂木条饰面以及开窗排列等元素的组合，在平坦空旷的草原基地上勾勒出醒目的建筑轮廓。另一个最新案例是由 ZGF 建筑事务所 (ZGF Architects) 在华盛顿州吉格港 (Gig Harbor) 设计的面积达 8 万平方英尺 (7 430m²) 的圣安东尼医院 (St. Anthony's Hospital)^⑧。这一顶级医疗设施的创作深受当地积淀丰厚的建筑传统以及场地周边自然景观的启发。最后一个范例是坐落于芝加哥的罗伯特儿童医院 (Ann and Robert H. Lurie Children's Hospital)。它建于尺度宜人的社区中，步行即可到达附近的西北大学医疗中心，成功地整合于城市肌理，并与城市边缘的郊区医院形成鲜明对比。这种基于地域理念的建设项目被视为明智的投资，为达成医院和在社区的共同目标发挥了积极的作用。

八、紧凑型社区中的“健康村”

在美国，前沿的医疗建筑学主张在高密度、步行尺度的校园环境中建筑医院，而避免建于城市远郊与世隔绝的设施，这样人们就不必非得依赖机动车前往就诊。从建筑的角度描述“健康村”(health village)即相互毗邻的独立医疗护理设施的集合。这一术语容易与“健康社区”(healthy community)混淆，但后者强调整个社区的健康状态而不涉及任何具体的医疗设施。目前很多社区医院选址在相互毗邻的医疗设施组团之中，面向广大的住院和门诊人群提供服务。还有越来越多的医疗设施被设置于综合体建筑中，与公共图书馆、餐厅、商业店铺、星巴克、药店和健身水疗中心等服务设施通过步行道、自行车道或户外休闲空间连接，而这些已成为医疗空间的延伸，同样具有疗愈和促进建筑的作用。

“健康村”的一种模式是由大量的方形城市街区组成，例如位于南卡罗莱纳州查尔斯顿的南卡罗莱纳医学院 (Medical University of South Carolina) 校园在 150 多年的建设中通过慎重的加建和对旧设施的精简以积极融入周边社区环境。另一种健康村组团包括老年生活护理设施、门诊康复服务设施、医护人员办公楼和员工住所，例如同样位于南卡罗莱纳州的格林维尔医院系统佩特伍德校区 (Patewood Campus of the Greenville Hospital System)。与国际化风格规模庞大的“巨型医院”(megahospital)不同，“健康村”采用以病人和家属为中心、提供一站式护理服务的模式，而且多位于或靠近城市中心地区而非边缘城郊，在一定程度上也抑制了城市的无序扩张蔓延。近期的典型范例是由芝加哥的 RTKL 事务所设计、坐落在密歇根州克拉克斯顿 74 英亩 (30hm²) 地块上新的“医疗村”(Healthcare Village) 项目，其总体规划基于新都市主义的设计原则，即“反对一切形式的美国郊区扩张”^⑨。

九、老龄化社会的养老设施需求

2010年，美国拥有超过 4 000 万的 65 岁以上老年人口 (比 2000 年增加了 500 万)，占总人口数的 13% (10 年中，老年人口占总人口的比例也显著提升)；75 ~ 84 岁的老年人口已达 1 300 万，几乎比 2000 年人口普查时多出 70 万，另外 85 ~ 94 岁的长寿老人数量也高达 500 万，比 10 年前多出 150 万。预计 2020 年美国人口总量将达到 3.25 亿，所以大量老年生活护理设施正在全美兴建，并已成为传统私人疗养院之外的另一个选择。华盛顿州贝尔维尤的日升老年生活护理中心 (Sunrise of Bellevue) 建于山坡上，开放式环形走廊的设计让使用者享有 180° 的景观视线。楼层平面布局紧凑，短走廊的设计实现了建筑使用的高效。主入口周边设置了开放廊道、吸烟室、走廊、图书阅览室、活动室、酒吧间、餐厅以及门厅等公共空间。每个房间都带有由冰箱、水槽和储物柜组成的小型厨房。70 间私人居室中有 18 个专为患有痴呆症的老人配备的特殊单元，安装有专门的盥洗和淋浴设备。公用空间被集中布置在二层。在每一层，主要行走流线都邻中央的看护员工办公室设置，使老人能够便捷前往餐厅、户外露台、活动室、厨房、过厅、洗衣房与康复水疗中心等公共空间。

位于密歇根州大急流城的苍鹭庄园老年生活护理中心 (Heron Manor Assisted Living Center) 获得了 LEED 白金等级的认证。项目场地靠近城市中心区域，建筑周边草木葱郁，并设有可供穿行的铺地以鼓励居住者增加户外活动。全部 72 间公寓配备无障碍式卫生间，内有方便轮椅进入的淋浴隔间。每间公寓都配有全套厨房设备，使住户可以单独烹调个人喜爱的食物。护理中心中还设有少量的双居室公寓。与当地公共交通的紧密联系、雨水回收和

储存的水池靠近基地旁的保护湿地，以及配备有地热能加热和制冷系统等特点帮助这座 5.9 万平方英尺 (5 480m²) 的护理中心获得了 LEED 白金等级的认证。

十、借用自然：人工的康复性疗法

治疗花园 (therapeutic gardens) 一直是在美国医院和诊所广受欢迎的设计策略。精心布置并能调节气候的花园能够帮助病人、家属及工作人员恢复神气，也能滋养人文情怀。特别是高度密集的城市环境中，康复花园显得尤为重要。一个精心设计的康复花园使人们在树荫下、喷泉前、小池边与自然亲密接触，休憩或冥想。今后 10 年美国顶级的医疗设施对康复花园的设计会有更高的要求——消除室内外空间的实体分隔。如 2010 年笔者与克莱姆森大学 (Clemson University) 896 小组 (Team 896) 共同设计的水疗康复中心 (spa/wellness center) 即具有内外空间无缝相间的特点 (图 4)。对传统的空间和视觉性屏障的消除被称为治愈化疗法 (theraserialization)——多层次透明性的延续与传统的过渡 (半户外) 元素 (比如露台、玻璃滑门、悬挑结构、棚架和屏风、树木等) 设计策略的融合，创造了多层次的室内外良好过渡的柔性场域 (soft zones)。相似案例如弗吉尼亚州米德洛蒂恩市的圣弗朗西斯医疗中心 (Bon Secours St. Francis Medical Center)、亚利桑那州菲尼克斯市的邦纳医疗中心 (Banner Estrella Medical Center) 和西雅图儿童医院 (Seattle Children's Hospital)。这些场所能帮助病人缓解压力，感受到身体和心灵的康复，并充满生机与活力。康复花园可以分为被动式和主动式两种，被动式指的是病人通过欣赏自然的美得到治愈，而主动式则是指将花园作为运动或野餐的场所以达到康复的目的。

另一个热门的人工疗法是应用电子媒介来呈现自然环境场景。许多医院的无窗病房都通过采用人工电子显示屏来弥补自然场景的缺失。美国克莱姆森大学最近研究探索了非常实用的 9 块面板式后置的投影视图网格，病人可在病床自主控制 9 个单独的场景板投射到病床对面墙上的图像。另外，在很多领先的医院中还安装有呈现自然场景视图的天花。例如明尼苏达州大学儿童医院病房里安装了大气层模型的天花板，带有圆形凹槽的天花能够数字投影夜空场景，或四季变换的颜色，或森林、河流、溪流和海洋等场景。

结语

本文的简要概述虽然不能涵括所有当今影响美国医疗建筑的趋势，但确实代表了行业中正在发生的变化。综合的、目录式的阐述需要更多篇幅，但是本文论及的十大趋势指向一个共同点——医疗建筑正在朝着生态人文主义的方向发展。对建筑师

而言,所有的理念都应以对生态环境可持续为最大考量,保护地球上日渐消失的不可再生资源,坚持建筑学中人文主义和悲悯情怀以确保人类和生态的健康。总体而言,在当前美国的经济形势仍旧不明朗的情况下可以确定的是,2014年即将实行的医改法案产生的影响将不可预测。■

注释及参考文献

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Change is an accepted fact of life in American healthcare. The U.S. population continues to grow and an expanding population exerts new pressures on the nation's healthcare facility infrastructure. Many hospitals and healthcare organizations, and especially those in the private sector, are uncertain at this time as to whether to expand, renovate their existing facilities, or to build completely new facilities. Much of this uncertainty is attributed to coming changes to the healthcare industry in the wake of national healthcare reform legislation. This recent legislation, the federal Health Care Act of 2010, takes full effect in 2014. Healthcare organizations in both the for-profit and the governmental sectors are uncertain as to the full ramifications of this new law. Will this result in an influx of newly insured patients into the system, therefore causing excessive strain on existing facilities? Will these new patients be re-distributed disproportionately from public facilities to private facilities, or will the opposite occur? No one is certain as to what will happen, but regardless, as many as 31 million more Americans will have at least a minimum tier of health insurance by 2014 and there are certain to be many unforeseen ramifications. At present, there are more than 48 million Americans without any form of health insurance. Against this fluid backdrop, it is a challenge to attempt to predict with any degree of precision the future beyond 2014. With this disclaimer stated up front, the following are ten current trends in American healthcare architecture in 2012:

1. The Loss of Modernist Hospitals and Clinics

Hundreds of mid-20th century historic modernist American hospitals have already been demolished, or are under threat of demolition. Unfortunately, no national statistics are kept on this trend. Demolitions of hospitals, clinics, and nursing homes have been occurring nationally for over fifty years as new facilities have been built to replace aged facilities in all fifty states. Yet at the same time, from the standpoint of ecological resource conservation it is increasingly considered imprudent to needlessly cast aside an historic modernist healthcare facility if it can feasibly be adapted to a new, useful life. The American Hospital Association (AHA) currently lists the number of U.S. hospitals at 5,754. By year 2020, there will be a 10% decrease in the number of U.S. hospitals, to around 5179. In 2010 the volume of new construction of healthcare facilities nationally totaled \$62.5 billion, and the volume of renovation projects totaled \$29.8 billion. With the focus squarely on new construction, hospital construction nationally totals 22% more than any other healthcare building type. Emergency departments: 23% more are planned in the next 3 years; imaging departments: 20% are to be built in the next three years; Surgery departments: 15% are planned to be built in the next three years.

An unfortunate case study: The battle to save the historic Charity Hospital in post-Hurricane Ka-

trina New Orleans erupted into a major contest between preservationists and the leaders of the hospital, the LSU Health Sciences Center (LSUHSC), who were determined to abandon a 1938, 900-bed at deco hospital in the heart of the city's central business district in favor of a completely new 340-bed replacement facility nearby. Hospital officials' claimed the iconic and beloved 1938 facility was obsolete and irreparably damaged by Katrina's floodwaters. This proved to not be the case, however, when the Foundation for Historical Louisiana in 2006 received a \$600,000 donation to commission a feasibility study to determine if the historic hospital could be re-used and brought back to life. A Philadelphia architectural firm, RMJM Hillier, conducted the feasibility study and presented a 200 page report in mid-2006 that detailed how Charity Hospital could be brought back to life better than ever before, for only half of the cost of constructing the LSUHSC-proposed replacement facility four blocks away. A contentious public debate raged over the next year over the fate of the historic hospital, with the replacement facility's advocates winning out over the historic preservationists. The new hospital is to open in 2014 and has been designed by NBBJ Seattle. The re-used historic hospital could have been rehabilitated into a premier LEED certified hospital at far less cost, in the city's historic core. As it is, a mid-20th century modern hospital is left to rot. This debacle symbolized a lost opportunity to retain a culturally and architecturally significant civic icon that had been loved by generations of New Orleanians^⑩(see S. Verderber, *Innovations in Hospital Architecture*. London: Routledge, 2010, Chapter 5).

2. The Accelerated Demand for Outpatient Care Facilities

Outpatient healthcare facilities in the United States proliferated after 1983, following the enactment of TEFRA and DRG healthcare reform legislation that shifted U.S. hospitals away from costly inpatient care to less costly outpatient care and treatment. The aim was to establish viable, prevention-based diagnostic and treatment alternatives and in so doing significantly reduce the average length of inpatient stay (ALOS). The result has been that the ALOS in the U.S. decreased sharply, nationally, since 1983 across the spectrum. Along with the shift to outpatient care, a wide array of new neighborhood freestanding clinic typologies emerged—most of these clinics were one-level in height and less than 10,000 total square feet. Many outpatient clinics opened in sprawling suburban communities. Most recently, the national downturn in the American economy in 2008 resulted in the abandonment of many shopping malls and other commercial types. These "dead malls" have proven to be ideally suited for conversion into outpatient care facilities.

One Hundred Oaks, in Nashville, was the first

enclosed shopping mall built in that city. It opened in 1968, a few miles from the downtown central business district and Vanderbilt University's main campus (Figure 1). Featuring 880,000 square feet of retail space on a 56-acre site and 4,000 parking spaces, the mall was declared "dead", i.e. vacant, by 2005, yet another casualty of the poor economy and its economically diminished surrounding neighborhood. Despite naysayers who questioned the wisdom of adapting a dead shopping mall into a healthcare facility, that is exactly what Vanderbilt Health did. With the help of architecture firm Gresham, Smith and Partners the mall was repurposed into a 450,000 square foot medical center, now home to 22 specialty clinics as well as a pharmacy, imaging suites, and labs, all housed within a LEED-certified enclosure. Once-forlorn parking lots were redesigned and enhanced with new landscaping and walkways. The adaptation of this dead mall also included a 47,000 five-level office building on the site. These clinics and support spaces straddle an 800-foot long circulation spine (Figure 2). The interior of the mall was gutted and rebuilt and its exterior was rebuilt and updated. The Vanderbilt Health One Hundred Oaks Outpatient Clinic Mall was completed in 2009[®]. Many more shopping mall conversions such as this will open in the coming decade.

3. Home-based Care and Virtual Medicine

For much of the 20th century, the hospital was the center of the healthcare universe for Americans. Immense urban medical centers were governed by a vast technocracy. Patients came to rely nearly solely on the hospital as the main source of healing, although this came with one major caveat: hospital-centered care is the most expensive care. The physician staff became hospital-dependent during this period, and the International Style modern medical center was designed first and foremost around the needs of the physicians, allied caregivers, and their employer-institutions—not around the needs of patients or their families.

Home-based healthcare is booming across America. With insurance companies now loath to pay for hospital-based inpatient care, the emphasis now more than ever is on home-based care. It is far less expensive, keeps the patient and family in familiar surroundings, and is accelerated by the Internet: the home-as-clinic. Computers and handheld devices make it possible to be in touch with one's doctor anytime from virtually anywhere on a 24/7 basis. Home-health agencies, for their part, focus on hospice care, rehabilitation, dietary services, and daily care needs. The individual, for his or her part, will soon be able to self-monitor his or her own vital signs. Rapid technological advancements are also making it possible for more elderly Americans to continue to live independently at home.

Telemedicine embraces medical technologies ranging from electronic health records to streams of emails between patient and doctor. Live, two-way

video connections such as SKYPE software now allow for real-time consultations to occur. And more and more Americans are turning to WEB-MD and other online resources for health information. The Media Lab at MIT in Boston is exploring the use of "virtual" doctors and nurses who can "speak" and "consult" with their patients online. In the very near future, holograms will project on one's living room or kitchen wall at home, and the patient will be able to see his or her doctor or nurse in virtual 3D-dimensionality—standing right in front of him or her in the living room or kitchen at home. The upshot of this is that healthcare consumers are now more knowledgeable—and more demanding—than ever before in history. The home-as-clinic metaphor now extends to include the physical attributes of the dwelling itself. Online resources now allow a home dweller to monitor its ambient air quality level.

4. The Maturation of Evidence-based Research and Design

The evidence-based research and design (EBR&D) movement is premised on three assumptions: first, patients should be able to devote their energies to healing and recovery without having to cope with an unsupportive care setting; second, healthcare providers should be able to perform their duties without becoming ill themselves due to being injured in the course of their daily duties and responsibilities; and third, healthcare facilities that consume inordinate amounts of nonrenewable energy resources are no longer acceptable. Above all, the EBR&D movement aims to reverse the number of medical errors that occur in hospitals. At present, more than 98,000 patients die each year in U.S. hospitals due to medical errors and hospital-acquired infection. In response, an accreditation and certification framework was recently established with the goal of building up a cadre of professionals in the industry who can combat the prevalence of medical errors. This new credential, known as the Evidence-based Design Accreditation and Certification (EDAC) program, was funded with a start up grant from the Robert Wood Johnson Foundation, based in New Jersey, together with The Center for Health Design, based in California. A set of three study guides were published by this organization in late 2008: *An Introduction to Evidence-based Design: Exploring Healthcare and Design*; *Building the Evidence Base: Understating Research in Healthcare Design*; and, *Integrating Evidence-based Design: Practicing the Healthcare Design Process*. It is an interdisciplinary that draws together physicians, nurses, administrators, architects, and national officials. However, critics view this as somewhat premature, arguing that the EBR&D database remains thin and in need of verification through more research.

The coalescence of the EBR&D movement is perhaps best symbolized in the Fable Hospital 2.0 Project. The "Fable Hospital" is a mythical institution

concocted to make the business case for the need for and value of EBR&D in hospital architecture at this time. It is partly based on the findings of the Center for Health Design's Pebble Project, which is a compendium of case studies in American hospitals on the application of EBR&D within the industry. Main issues addressed in the Fable Hospital 2.0 include the following: a call for larger single patient rooms, acuity adaptable patient rooms, larger windows, larger patient bathrooms with double door access, ceiling-mounted patient lifts above each bed, better indoor air quality to reduce the spread of airborne infections, decentralized nursing stations adjacent to every two inpatient rooms, hand wash sinks next to every patient bed, better lighting options, the reduction of noise on the nursing unit, the need to reduce energy consumption, the importance of artworks and nature, therapeutic gardens, provisions for family members, and digital technologies in the total patient experience[®] (see Sadler, Blair, Berry, Leonard L, Guenther, Robin, Hamilton, D. Kirk, Hessler, Frederick A., Merritt, Clayton, and Parker, Derek, "Fable Hospital 2.0: The Business Case for Building Better Healthcare facilities." February 2011. Online. Available at <http://www.thehastingscenter.org/Publications/HCR/Detail.aspx?id=5066.html>). Critics argue that the EBR&D case for the all-private room U.S. hospital has not conclusively been proven. Critics argue that too little empirical data exists upon which to make such a sweeping conclusion that would apply to all U.S. hospitals and all types of patient populations. The debate over the all-private room American hospital remains a point of contention due to the cost of building all-private room hospitals[®] (see Verderber, S. and Todd, Lindsay G., "Reconsidering the Semi-Private Inpatient Room in U.S. Hospitals," *Health Environments Research & Design Journal*, 5:2, Winter 2012, pp. 49-62).

5. The Push Toward the Carbon Neutral Hospital

Hospitals in the U.S. have a longstanding reputation as being among the worst polluters. They generate volumes of toxic waste and then do not take the proper measures to remediate and dispose these materials. Hospitals represent only 4% of the world's entire building stock but consume 8% of the planet's entire building stock. Public relations campaigns to play down this problem no longer suffice. It is now possible to apply the Environmental Protection Agency's (EPA) online Energy Impact Calculator to ascertain the carbon footprint profile of each and every zip code in the nation. When the Hackensack University Medical Center in 2008 launched its "greenness" campaign, it took out an eight-page advertisement in the *New York Times*. Healthcare institutions now realize the marketing possibilities through sound practices to reduce a healthcare facility's carbon footprint.

In the U.S., LEED (Leadership in Energy Efficient Environmental Design) is a program that

is sponsored by the U.S. Green Building Council (USGBC). LEED employs a point-based metric tool to guide best practices in sustainable design and construction across the entire country. It functions as a third party certification system that provides verification that a given healthcare facility meets required criteria for LEED certification. A rigorous registration, documentation, and review process is prerequisite to any facility awarded a rating at one of four levels: certified, silver, gold, or platinum. By 2009, 81,155 professionals in the U.S. and Canada had obtained LEED accreditation professional status (LEED-AP). For healthcare facilities, and back in 2003 the LEED-affiliated Green Guide for Healthcare program began. A self-certification metric was developed that closely paralleled mainstream LEED certification criteria as pertaining to acute care hospitals. Since 2007 the GGHC has registered construction projects in 115 countries globally, and is now even more prevalent than the core LEED certification program. In April of 2011 an official LEED for Healthcare certifying process was created. It is based on a total of 110 possible "points"—18 points for site planning, 9 points for water efficiency, 39 points pertaining to energy and atmospheric issues, 16 points for building materials and the conservation of natural resources, and 18 points related to indoor environmental quality factors. A certified level requires 40+ points, a silver rating requires 50+ points, a gold rating requires 60+ points, and a platinum rating for a healthcare facility requires 80+ points[®](see Ashley, K. "LEED for Healthcare: Human Health and the Built Environment," July 2009, *Environmental Design Construction*, 12:7, p. 46).

As of October 2011, overall, 8,391 LEED projects have been certified, while the number is far smaller for healthcare facilities, with only 298 LEED certified healthcare facilities (less than 4% of the total) in the U.S. as of that date. The Dell Children's Medical Center, in Austin Texas, became the world's first LEED Platinum hospital (in 2009). It features landscaped courtyards, 92% of all construction waste was recycled on-site, rainwater is reclaimed, an on-site natural gas turbine supplies all electricity (which is 75% more efficient than coal-fired plants), converted steam energy is supplied from the heating/cooling plant for all chilled water needs, and parking lots and all outdoor spaces are designed and landscaped to minimize the urban heat island effect[®](see Ferenc, J. "LEED for Healthcare to Help Drive Sustainable Design," *Health Facilities Management*, 24:1, p. 3-6). A fear exists in that a social class disparity will emerge between LEED and non-LEED buildings. Regardless, the LEED rating system has pushed forward a new standard where hospitals are now expected to feature zero waste design strategies, green roofs, therapeutic gardens that double function as rainwater retention reservoirs, geothermal systems, passive solar design strategies, recycled construction materials and

products, locations on public transit routes, and cycling amenities (Figure 3).

6. The Competition for Patients and Medical Tourism

A recent article in the *New York Times* underscored the pressures on hospitals to compete for patients by offering all types of amenities such as five-star cuisine, expensive bed sheets, lavish patient rooms with marble baths and sinks, private kitchens, and generous sleepover accommodations for family members. At the New York-Presbyterian/Weill Cornell Hospital in New York City, the pampering and décor rival a grand hotel, and is part of a competitive trend rapidly escalating across the U.S. This is actually nothing new in America, as VIP patient rooms have been available for the privileged classes since at least the opening of the Johns Hopkins Hospital in Baltimore in 1874. There, specially appointed VIP inpatient rooms featured hand carved beds and dressers, rocking chairs, artworks on the walls, and hand-woven tapestry rugs. This is part of a national (and international) competition for wealthy patients willing to pay extra, while at the same time the U.S. federal government cuts back on its reimbursement rates to hospitals. Worse, growing evidence suggests that more patients who do not happen to be wealthy are being subjected to long waits and wholly substandard care in American hospitals[®](see Bernstein, Nina. "Chefs, Butlers, Marble Baths: Hospitals Vie for the Affluent" Online. Available at <http://www.nytimes.com/2012/01/22/nyregion/chefs-butlers-and-marble-baths.html>).

The rapid growth in medical tourism is closely related to the intense competition for patients. For decades, American hospitals have sought to broaden their geographic reach by marketing their services far and wide beyond their home market. Well-known examples include the M.D. Anderson Cancer Institute in Houston, New York City's Cedar Sinai Medical Center, and the Mayo Clinic in Rochester, Minnesota. This trend has gained broad acceptance in the past decade and shows no signs of slowing down anytime soon. Many financially strapped smaller market specialty hospitals are also entering the practice of marketing their services regionally because it can be an excellent way to expand revenue. The renowned Cleveland Clinic recently opened a gleaming new medical center in Abu Dhabi, in the Middle East, designed by HDR of San Francisco. This is but one high profile example of exporting a proven brand name to a region that rapidly seeks to move up in prestige in terms of attaining world-class stature in its healthcare system. More patients are willing to travel farther than ever before in history to consult and be cared for by renowned neurological, cardiovascular, rehabilitation, and cancer treatment specialists.

7. Critical Regionalism

Postmodernism had opened by 1990 new pos-

sibilities for the site planning, compositional massing, and narrative aesthetic of healthcare facilities. The International Style previously had placed strict limits on what a healthcare facility could look like. The result was usually an austere box with flat roofs, lacking in ornamentation, without conscious references to local building technologies or aesthetic traditions. Now, innovative materials, construction techniques, and local cultural traditions are now legitimate architectural influences—design determinants in the formal organization, construction, and aesthetic language of healthcare architecture in the U.S. This movement is referred to as critical regionalism. Critical regionalism draws its inspiration from the uniqueness of local places, people, and regional culture.

The Grand Itasca Clinic (2005) in Michigan, by Kahler Slater Architects, of Milwaukee, expresses the Midwestern Prairie School architectural language of the great American architect Frank Lloyd Wright (1872-1959). Extended overhands, exterior wood cladding, and fenestration provide a striking silhouette set against its open, flat prairie site context. Another recent example is the 80,000 square foot St. Anthony's Hospital, in Gig Harbor, Washington State, by ZGF Architects. It is a state-of-art facility informed by its local community's rich building traditions and history and its surrounding natural landscape, a landscape framed and inspired by the surrounding trees and water[®](Online. Available at <http://www.archinnovations.com/featured-projects/health-care-facilities/zgf-architects.html>). Also see <http://www.healthcaredesignmagazine.com/article/walk-woods.html>). Another example is the Ann and Robert H. Lurie Children's Hospital, at Children's Memorial, in Chicago. It is successfully woven into an urban context that sharply contrasts the site contexts so common to sprawling suburban hospitals. It is located in a pedestrian scaled neighborhood adjacent to the campus of the Northwestern University Medical Center. Building with locality in mind is now seen as a wise investment, an investment that is yielding positive results in the form of a greater sense of shared purpose and goals between a hospital and its local community.

8. Health Villages in Compact Neighborhood Settings

Cutting-edge hospital architecture in the U.S. rejects the stand-alone isolation of sprawling suburban settings in favor of denser, pedestrian-scaled campus contexts where it is possible to walk to the hospital without always having to arrive by auto. A health village, architecturally, is a concentration of freestanding care providers sited in relatively close geographic proximity to one another. This term is sometimes confused with the term healthy communities. But a "healthy community" is a term that refers instead to the health status of a community—not to any specific healthcare facilities in it. Many community hospitals are now situated within

clusters of interdependent healthcare facilities that serve a broad mix of inpatient and outpatient populations. Increasingly, healthcare facilities are housed within mixed-use complexes that may include a public library, restaurant, commercial businesses, a Starbucks, pharmacy, or a wellness spa. These amenities are connected by walking paths, cycling paths and places to stop and sit outdoors, where the exterior realm becomes a therapeutic, health-promoting extension of the interior realm.

A health village may comprise a number of square blocks, such as at the Medical University of South Carolina, in Charleston, South Carolina. There, a campus built over a 150-year period is actively repositioning itself to become more fully integrated into its surrounding neighborhoods through the careful addition and subtraction of its facilities. A health village may also include an assisted living facility for the aged, outpatient rehabilitation services, offices for healthcare professionals, and housing for staff, such as what is evolving on the Patewood Campus of the Greenville Hospital System, in Greenville, South Carolina. Health villages are the antithesis of the monolithic International Style megahospital, and are family and patient centered, provide a one-stop point-of-service care model, and are an antidote to unchecked urban sprawl when located at or near to the center of a city or town and not at their periphery. A strong recent example is the Healthcare Village, a 74-acre site in Clarkston, Michigan, designed by RTKL of Chicago. It applies the principles of the New Urbanism, an urban planning movement that rejects American suburban sprawl in all its forms⁹(see Jones. M. "Phase One of RTKL-Designed Healthcare Village Opens," *Healthcare Design*, December 15 2009. Online. Available at <http://www.healthcaredesignmagazine.com/news-item/phase-one-rtkl-designed-healthcare-village-opens.html>).

9. The Need to Care for an Aging Society

In 2010, there were 40 million people in U.S. aged 65 or older (five million more than in 2000). This amounted to 12.4% of the total population in 2000 and 13.0% of the total population in 2010. And the proportion of old-elderly persons also grew significantly during the decade. By 2010, 13 million people were aged 75 to 84 years old (nearly 700,000 more persons than in the 2000 national census). In 2010, five million people were aged 85 to 94 years old (1.5 million more than ten years prior). By 2020 it is projected that 325 million persons will reside in the U.S. and many assisted living facilities for the aged continue to be built across the country. They are a non-institutional alternative to traditional nursing homes. The Sunrise of Bellevue assisted living center in Bellevue, Washington is located on a hillside and its siting and architectural design make full advantage of 180-degree views of the landscape through its open wrap-around porch and three-season porches. The center's floor plate

is compact, with the result a highly efficient building with relatively short corridors. Eight common spaces (three season porch, smoking room, porch, library, parlor, bistro, dining room and foyer) are clustered around a main front entry. Each resident's room contains a small tea kitchen with refrigerator, sink, and cabinets. Eighteen of the 70 private bedrooms are equipped for residents with dementia. These units are the same size as the assisted living bedrooms but have specially equipped bathrooms and showers. Common spaces are clustered on the second level. A walking loop adjacent to the central caregiver staff office on each floor puts residents in contact with the dining room, an outdoor patio, activity room, kitchen, living room, laundry, and a therapeutic spa.

The Heron Manor Assisted Living Center, in Grand Rapids, Michigan, is certified LEED Platinum. The center's site is within walking distance of downtown and is surrounded by private woods with a paved walking trail that encourages residents to experience the outdoors. All 72 apartments are equipped with barrier free bathrooms, with shower stalls that easily accommodate wheelchairs. Every apartment has a full kitchen so residents can prepare their meals independently if they so elect to do so. A limited number of 2-bedroom apartments are available for residents. Heron Manor earned LEED credits for its connection to local public transit services, and creation of a natural rainwater retention pond adjacent to the wetlands that were preserved immediately adjacent to the site. A geothermal heating and cooling system was installed. This 59,000-square-foot facility was certified at the LEED platinum level.

10. Nature as a Therapeutic Modality: Real and Artificial

Therapeutic gardens are a continuing trend in American hospitals and at many outpatient clinics. A well-designed and climatically responsive garden empowers the patient as well as the patient's family (and also staff personnel). It can help to regenerate the human spirit. This is especially the case in dense, urban settings, where a therapeutic garden must be far more than a sterile space devoid of character. A well-designed therapeutic garden provides spaces for personal respite and contemplation outdoors, while remaining in close contact with nature in the form of shade trees, fountains, or a small pond. The top healthcare facilities in the U.S. now and in the next decade will continue to feature prominent therapeutic healing gardens with the aim of de-materializing and eliminating the physical barriers that typically isolate the indoor realm from the outdoor realm. A spa/wellness center designed by this author and Team 896 at Clemson University in 2010 features this type of seamless connection between the indoors and the outdoors (Figure 4) The braking down of the traditional spatial and visual barriers is defined as the serialization, and is the

continuum of layered transparency combined with the design strategy of superimposing transitional (semi-outdoor) features such as patios, sliding glass doors, extended overhangs, trellises, and trees for protective screening from the elements. These design features create hierarchical soft zones of transition between the indoors and the outdoors, such as what was achieved at the Bon Secours St. Francis Medical Center, in Midlothian, Virginia, by Odell Architects, of Richmond, Virginia, at the Banner Estrella Medical Center, in Phoenix, Arizona, and at the Seattle Children's Hospital, in Seattle, by NBBJ Architects. Therapeutic gardens assist in helping the patient (and family member) reduce stress and achieve a more balanced physiological and psychological state, and can help in one's summoning of the inner strength to overcome his or her disease. These places are restorative, rehabilitative, and biophilic. A therapeutic healing garden can be designed to be passive (purely aesthetic) or active (a place to play sports or have a picnic).

The electronic representation of scenes of natural environments is also gaining in popularity. Many hospitals are featuring surrogate (artificial) views in rooms that would otherwise be architecturally windowless. Recent research a Clemson University in the U.S. explored the usefulness of a nine-panel rear-projected view grid that allows the patient from one's bed to self-control the view content of any of nine individual view panels projected on the wall facing the patient's bed. Also, ceiling views of nature are being installed in many leading hospitals, such as the atmospheric ceiling prototype installed in the patient room above each patient's bed at the University of Minnesota Children's Hospital, in Minneapolis. A circular recess in the ceiling above the patient bed is capable of digitally projecting a nighttime sky scene, the changing colors of the four seasons, or representational views of forests, rivers and streams, or the oceans.

Summary

This brief overview is no means an exhaustive list of the trends that are influencing healthcare architecture in the U.S. at this time. But it does represent an overview of what is happening now. Any comprehensive inventory would require far more space than is available here. But these ten trends do share one thing in common—all are centered on the precepts of an emerging movement towards ecologist healthcare architecture. For architects, this paradigm fuses together in a single framework the highest priorities of ecological sustainability. The need is urgent to protect the earth's disappearing non-renewable resources, and to apply the precepts of humanism and compassion in architecture in support of both human and ecological health. In conclusion, one thing is certain in 2012—the current economic situation in the U.S. remains fluid and rather unpredictable in light of the coming national healthcare reform legislation in 2014.