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RESEARCH ARTICLE

The evolving role of evidence-based research in healthcare facility design competitions

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Abstract
The architectural design competition remains a widely accepted method to advance design innovation, creativity, theoretical discourse, and the profession. In the realm of healthcare facility design, by contrast, clients and their sponsoring organizations seldom utilize this method. The reasons for this are many, and continue to stand in stark contrast to a growing body of evidence-based research and design (EBR&D)that is potentially of value in improving performance-based dimensions—esthetic and otherwise—of healthcare facilities globally. A comparative analysis of the entrants to a recent U.S. completion was conducted. Based on the results of this analysis, a two-phased healthcare facility design competition paradigm is put forth that is premised on the assumption that the intuitive dimensions of design creativity can be further advanced by means of a well timed and thoughtful injection of quantitatively based knowledge pertaining to patient, family, staff, and organizational concerns and priorities. This proposal's limitations, and future opportunities, are discussed.

1. Introduction

The field of evidence-based research and design (EBR&D) has developed significantly since 2000. This has been achieved through a mixture of systematic research, and a sustained focus on its application. This knowledge base, as advanced by specialists in many parts of the world, promotes user-focused built form and therapeutic landscapes, care settings that facilitate improved patient recovery rates, building inhabitants' safety, welfare, and productivity, and the promotion of environmental sustainability (Berry, et al., 2004, 2008).This knowledge is currently being assimilated into the healthcare facility design process (Sadler et al., 2011; Grant, 2013). These developments, while still embryonic, hold vast promise to in time

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represent a landmark achievement(Verderber, 2010). Nonetheless, in many quarters, architectural design competitions, and healthcare design competitions in particular, remain suspect with regards to their value or their return on investment (ROI). Such attitudes are partly the result of the upwardly spiraling costs of participation on the part of architectural and engineering (A/E) firms. Problems associated with client and sponsor 'pay to play' scenarios also persist, especially when the A/E firm must shoulder the entire cost with no assurance that any portion of the entrant's financial investment will be recouped.

It is said that the "best" competition design entries often lose. While statistics on this are hard to quantify, graphically seductive entries often garner a disproportionate share of honors and awards, with skillful graphics and carefully constructed models taking precedence (Nasar, 1999).Competition juries often represent a mixture of architects and non-architects. As such, debate swirls around whether the non-architects on a jury are suitably qualified. Are non-architects too uninformed of the inner profundities of architecture and building-making to judiciously assess a given submittal's full merits? In the absence of juror prescreening, some layperson participants indeed run the risk of being seduced by all the wrong things (Nasar, 1999).

The environmental design research literature supports the position that in a design competition, looks can be more important than substance: "Professional juries...are swayed by the look of the presentation rather than the substance of the design itself" (Anthony, 1991). The Handbook of Architectural Design Competitions (2011) stipulates that certain types, including healthcare building types, may be inappropriate when commissioned as the result of a design competition (Strong, 1996).This bias reflects a deeper negativity towards healthcare facilities, rooted in the eighteenth century lunatic asylum—a place singularly about institutional control. To a certain extent, such attitudes persist to the present (Verderber and Fine, 2000; Verderber, 2005, 2010).

European healthcare design firms tend to have more opportunities to enter competitions compared to their American peers (Death by Architecture, 2007), such as the 2012 *Nurture Collegiate Healthcare Design Competition,* sponsored by Steelcase (Nurture by Steelcase, 2012; Young, 2012a, 2012b). Another recent example was the winning entry, by 3XN of Denmark, for Copenhagen's Central Hospital expansion. The winning entry's renderings illustrated a maximization of façade surface area as a device for the transmittal of abundant natural daylight into the building envelope (Labarre, 2012). Herzog and deMeuron won another recent healthcare competition, for the Zurich Children's Hospital (Anon, 2012). A well-known initiative is the underwriting of firms' fees by a foundation set up in honor of Maggie Keswick to construct a global network of women's outpatient facilities known as the *Maggie's' Centres* (Jencks and Heathcote, 2010).

Competitions for healthcare facilities tend to be by invitation only. Do sponsors fear an open submissions process will unleash the floodgates to unqualified firms and unbuildable submittals, therefore undermining the sponsor's ROI? Pre-selection, coupled with costly entry eligibility requirements, are used as prescreening devices (Spreiregen, 1979; Strong, 1996). A third strategy, requiring an entrant to prequalify on the basis of first having to demonstrate sufficient technical expertise, is also used with some frequency. In addition, in the U.S., anti-hospital biases appear to continue to dissuade would-be external, third party, philanthropic sponsors from sponsoring healthcare design competitions, i.e. private foundations. This may be because their sheer technical nature scares away *high profile* entrants that philanthropists are so drawn to as a source of sponsor status and prestige(Spreiregen, 1979; Nasar, 1999). Meanwhile, the American Institute of Architect's (U.S.) *Handbook of Architectural Design Competitions* continues its noncommittal stance, defaulting to an esthetic, formalist bias, eschewing complex building types such as healthcare (Nasar, 1999). Few competitions are held on the subject of healthcare, perhaps due to these reasons:

- *Professional Biases*—A longstanding bias against hospitals because they are dismissed as an overly institutional building type in the view of the mainstream profession, compounded by the perception that healthcare facilities, hospitals or otherwise, aresimply too technical in nature, and therefore stymie design creativity.
- *Lack of Sponsorship*—A lack of sponsorship within the industry and society, with few would-be philanthropically focused organizations or private sponsors interested. Change in this regard will require sponsors able to garner attention and prestige by underwriting the fees of entrants, including the winning A/E firm, and also by providing funds for the documentation of a winning scheme through to construction and beyond to full occupancy.
- *The Competition Process*—Suspicionpersists on the part of healthcare administrators, whose job performance is predicated on adherence to tight budgets, timetables, ROI, and accountability to stringent cost containment criteria. To a governing board, a competition and its attendant uncertainty may be viewed as a threat to healthcare corporate investors and elected leaders in government agencies.

The fact that so few design competitions in healthcare take place is to be taken itself as a challenge to the profession. This presents a challenge to articulate a protocol whereby evidence-based knowledge can be incorporated within a healthcare facility competition. These focus areas are (1) The need for research on patient quality and patient safety, (2) Research on the relationship between facilities and healthcare expenditure and reimbursement policies, (3) The aging of global societies and the growing caregiver shortage in many parts of the world, (4) The rise of health informatics and the eradication of the digital divide, (5) The increasing importance of genomics, (6) The need for facility-based research on disaster mitigation and emergency room overuse, and (7) Further research on the importance of environmental safety and sustainability.

The *Center for Health Design's* certification program, 'Evidence-based Design Accreditation and Certification,' or EDAC, launched in 2008, reports that as of the end of 2013 more than 1000 individuals had become EDAC-certified. This program:

> "Awards credentials to individuals who demonstrate a thorough understanding of how to apply an evidence-based process to the design and development of health-care care settings, including measuring and reporting results. Mission: To develop a community of certified industry professionals through education and assessment…Vision: A world where all healthcare environments are created using an evidence-based process." The five stated operational goals of this process are to foster improvements in: A. Overall healthcare quality, B. Organizational efficiency and flexibility, C. Facility-centered cost efficiencies, D. Access to evolving technological knowledge, and E. The attainment of carbon neutral healthcare facilities (The Center for Health Design, 2013a, 2013b).

With the growing number of professionals certified in this area, it stands to reason that they should be called upon to apply this credential not only in day-to-day practice but also in the context of design competitions.

An analysis of a subset of nine entrants to this U.S. healthcare facility design competition is reported below. This analysis functions as a device to examine how to overcome the abovementioned obstacles to healthcare design competitions. It is assumed that the outcome holds the promise of shedding further insight on the aforementioned impediments to the more widespread use of healthcare design competitions. The three goals of the following discussion are therefore (1) To examine the role and function of the competition format in healthcare facility design and construction; (2) To examine how the analysis of a recent design competition in the United States can help counter why so few such competitions occur; and (3) To present a protocol by which EBR&D can assume a more meaningful role within the framework of healthcare facility design competitions now and in the future.

2. Methodology

The results are reported of a content analysis conducted on the nine finalists' second stage submittals to the Kaiser Permanente *Small Hospital/Big Ideas* competition (Kaiser Permanente, 2010a, 2010b, 2013; Guevarra, 2012; Planetizen, 2012). Kaiser Permanente's call for entries sought out "Design concepts for a small, eco-conscious, patient-and family-friendly hospital that uses the best in emerging medical technology to coordinate and deliver healthcare." The site provided was a site in the desert community of Lancaster, California, bordering the Lancaster City Park. Aside from a call for "dynamic building design," the sponsor sought new creative models for the delivery of cost effective healthcare in innovative care environments (Grant, 2013).

Content analysis entails a detailed, systematic text examination and interpretation protocol, with the aim identifying key and persistent patterns, themes, biases, and their nuanced meanings (Berg, 2006; Leedy and Ormrod, 2005; Neuendorf, 2002). Data subjected to this type of qualitative content analysis can consist of myriad recorded and written communications, including transcripts of interviews, texts, oral discourses, observations, videotapes, and archival documents (Mayring, 2000). In recent years, several computer-based algorithms have been developed within the framework of qualitative content analysis in supportof textual interpretations. For purposes of the task at hand, MaxQDA was utilized in text analysis (on screen) by sifting through the material, while highlighting text, terms, and phrases, writing notes, defining categories and setting coding rules and parameters.

MaxQDA also functions as a document center, recording all steps of analysis throughout all rounds of interpretative analysis, thereby rendering the formal analysis as comprehensible, replicable, and with the ability to trace back to its source information. This software can also guide the construction of code relation matrixes and in the calculation of descriptive statistics, such as means, medians, and frequency distributions. These submittals were labeledS1–S9, in the alphabetic order of each team's Project Title. Two entries would win (co-sharing top honors) the competition (S1 and S6—see below). The qualitative analysis software MAXQDA focused on S1–S9 building design and site planning concepts, more fine grain details, each A/E team's use of EBR&D knowledge, and to what degree.

3. Analysis and results

The five aforementioned EDAC themes/challenges were used to structure the results of the MAXQDA content analysis (The Center for Health Design, 2008). The titles of the five categories, however, are extrapolated somewhat (see below) in order to provide for a more fluid presentation of the findings across S1–S9. These data are reported in Table 1. As for the assessment of their aesthetic merits, the information provided by entrants across the nine schemes was rather uneven. This made it difficult to comparatively assess their relative merits. Only five of the nine team's submittals provided a sufficient number of floor plans and/or perspective renderings to allow for any degree of precision with regards to the comparative assessment of their esthetic properties. The unevenness of the submittals in this regard this therefore made it difficult to include a specific category, i.e., Esthetic attributes, within the scope of content analysis process (see Note 1). Regardless, all nine A/E teams made reference to EBR&D in their proposals, to varying degrees (Table 1).

3.1. Improvement of healthcare quality

In this category, design attributes mentioned most often in S1–S9 centered on the patient room and bathroom (cited in 7 submittals), the arrival lobby and intake areas (cited in 5 submittals), family support spaces (cited in 6 submittals), dining and dietary services (cited in 6 submittals), community outreach activities (cited in 7 submittals), therapeutic landscapes and healing gardens (cited in all9 submittals), and the provision of home-like amenities/privacy and comfort (cited in 8 submittals).As for detailed concepts in this regard, S8 provided the most detailed programming and design information for a variety of interior functional spaces, including the patient housing area, emergency department, diagnostic units, laboratories, interventional service spaces, and administrative spaces. Seven submittals provided a detailed proposal for inpatient rooms and their immediate environs and designed to offer privacy and autonomy to patients and families. Typically, across the submittals, family

Table 1 Content analysis of case study/design competition submittals.

Attributes	S1	S2	S3	S4	S5	S6	S7	S8	S9
A. Improvement of Healthcare Quality									
Functional space/program attributes									
-Patient room/bathroom	○	○	○	○	●		○	●	
ED/UCU[a]	○		○	○		○		◒	○
ACU/ICU[b]	○		○	○	○	○			○
PACU[c]/Universal Care unit			◒		○	○	◒	●	
LDR/LDRP[d]	○				○				
Pharmacy/Diagnostic services	◒			○			○	◒	○
-Imaging services/Laboratory and pathology	○				○	◒		●	
-Interventional services	◒		◒		●			◒	◒
-Administrative services							◒	●	◒
-Material management	○				○			●	○
-Arrival/lobby/intake orientation			○		◒		◒	●	◒
-Security and disaster preparedness amenities								●	
Staff work environment						●			
Public circulation corridors			◒		●				○
Family/social support spaces	○	○	◒		◒	●			○
Dining and dietary services	○	○	○				●	◒	○
Community outreach activities/spaces	◒	●	◒	○	○	○	◒		
Total patient experience									
-Wayfinding	○				○		●		
-Windows and exterior views	◒		◒			●		◒	◒
-Therapeutic landscapes/healing gardens	●	◒	○	○	●	◒	●	○	●
-Smart room concepts			◒	◒	◒			●	
-Multi-media amenities			○		○			○	
-Home-like amenities/comfort and privacy	●	●	○	●	◒	●		●	◒
Patient safety	◒		◒			●		●	◒
B. Organizational efficiency and flexibility									
Patient/Family circulation patterns							●	○	●
Staff circulation patterns							●		○
Care delivery system	◒		○	○	○	●			
Off-Site prefabrication/Modular construction	○	○	○	○	●		◒	○	○
Day to day/Long term facility adaptability	●	◒	●	●	◒	●		●	●
Speed of construction					◒			●	
C. Attainment of cost efficiency									
Cost savings through sustainable facility planning/Design strategies	◒			◒	◒	◒		●	
Operational savings through improved care delivery	○					○		●	
Patient care/Cost efficiencies		●							
D. Technology utilization									
Social networking/ Virtual hospital amenities		◒	○		●		○	●	
Robotics and automation/Patient ID guidance system	◒	●	○	○	○			●	○
Construction technology innovations				◒	●		●		
E. Attainment of Carbon Neutral Facilities and Campus									
Non-toxic material palettes				◒		●			
Biohazardous waste disposal systems/Policies		◒			◒	●		●	
Water conservation systems/Policies	●			●		◒		◒	
Energy conservation systems/Policies	○	○	○	○	◒	○	○	●	○
Environmental impact/ Minimization of carbon footprint	●	●			●	◒	◒	◒	◒
Indoor comfort control		○							◒
Public transit linkages		●			●				
Biodiverse landscaping strategies		◒			◒	◒		◒	

● Strong relationship between specific environment-based issue/attribute and submittal.
◒ Moderate relationship between specific environment-based issue/attribute and submittal.
○ Minor relationship between specific environment-based issue/attribute and submittal.
Empty cell indicates no explicit relationship expressed in submittal.
[a]Emergency Department/Urgent Care Unit.
[b]Acuity Adaptable Care Unit/Intensive Care Unit.
[c]Post-Acute Care Unit.
[d]Labor Delivery Recovery Unit/Labor Delivery Recovery Postpartum Unit.

support spaces were integrated into the inpatient realm, with S4 proposing a "one-room-type hospital" concept as *"a highly functional, flexible space that focused all patient activities in the home-like environment of the patient's room."*

The importance of social support and community outreach was also frequently cited. The co-winning submittal (S1, by ADITAZZ) proposed a concept of *"crossing boundaries"* whereby re-envisioning the hospital of the future as *"a place focused on community—a place of activity, engagement, interaction, education, and fun, as much as healing and intervention."* The other co-winning submittal (S6, by the team of M+NLB/Perkins+Will, New York) reimagined its hospital's as an integrated, multi-use campus with the community a key partner, with the hospital functioning as a virtual *civic center.* Other submittals echoed this sentiment although to a somewhat lesser extent:

> *"Today's hospital is an oversized building isolated from the community; we propose to break itapart and integrate it into the community as a wellness hub."—S7*
> *"(Our design) is not a hospital; it is a community health hub. It is a place where the local community finds resources for education and wellness…it is a place to go to the gym, to take a cooking class, to work in a garden, to meet support groups, to talk with a physician and to consult with real and virtual specialists."—S2*

As for the role of nature within the hospital's physical envelope, five out of nine submittals mentioned the therapeutic amenity of adequate windows and meaningful exterior views and how these would facilitate a more positive experience compared to current hospitals. All nine submittals mentioned therapeutic landscapes and healing gardens as playing an important role in enhancing patient recovery rates in their proposed facility with S1 proposing an "*Agora*" as a multifunctional outdoor room that would invite its 24/7 use by the local Lancaster, CA community for art exhibits, musical and stage performances, and various physical fitness-related activities. This Agora would be shaded in summer months, with trees, plants and vegetated facades providing an "*oasis*" at the heart of the hospital campus. Courtyards, various types of healing gardens, roof gardens, and vertical green landscape walls and outdoors settings were mentioned in all nine submittals, to a varying degree with S9 designing its hospital's main entrance as a garden to *"blur the boundary between internal and external space."*

> *"All incoming elective procedure patients, their escorts and their visitors access the hospital through a controlled entrance point, to secure parking and then externally through terraced garden arcades to their room."—S9*
> *"Primary and secondary program elements are situated along a landscaped 'garden spine' that provides simplified wayfinding…This integration with nature creates a serene and revitalizing healing environment for all patients, staff, and visitors."—S7*

3.2. Organizational efficiency and flexibility

In this category, design attributes mentioned most often in S1–S9 centered on how a given team's proposal will enhance current care delivery models employed in Kaiser–Permanente hospitals (cited in 5 submittals), the incorporation of off-site premanufactured components and modular construction techniques (cited in 8 submittals), and their proposal's day to day as well as long term ability to adapt and flex as needs change in the future (cited in 8 submittals). The content analysis further identified two major types of strategies to attain increased facility efficiency and flexibility. As for prefabrication and modularity, for instance, S5 proposed a total prefabricated *"modular hospital"* as its core design innovation. As for 'universal' modular units, the S5 team examined the most common current nursing unit typologies, including 6-bed nursing blocks, 12-bed back-to-back nursing unit configurations, 12-bed corner circular unit configurations, 18-bed triangular units, 24-bed circular units, elongated triangular units, and rectangular unit configurations. This team also studied in detail prototype "template" hospitals and reported on their multiple methods of assemblage on site: *"Finding the best combination of unit size and configuration is the key to the success of a flexible modular system"—S5* Based on in-house research, the S5 team presented a universal modular unit it created featuring modular connectivity, flexible circulation, spatial adaptability, structural computations, and prefabrication guidelines for assembly. A total of seven footprint variants of their modular hospital, adapted to seven diverse sites, and seven different mixes of services, were presented. At the other end of the spectrum, only three submittals addressed patient and family or staff circulation patterns, and only two mentioned anything related to their proposal's time required for construction.

3.3. Attainment of cost efficiencies

In this category, the design attribute mentioned most often focused on cost savings to be incurred through facility planning and design strategies (cited by 5 submittals). This was followed by only three submittals that made any mention of operational savings incurable through improved care delivery methods as a result of their proposed hospital. Interestingly, only one submittal (S2) made specific mention of patient care-related cost efficiencies incurable as an outcome associated with their hospital proposal. Five submittals mentioned various facility design strategies to reduce operational cost outcomes, most of which would focus on the reduction of day-to-day building constructional expenses. Employment of sustainable architectural elements and modular construction were also proposed to make a significant contribution to cost effectiveness. Across S1–S9, only one submittal made mention of any type of a reduction in the acuity of care that would need to be provided in their hospital. This submittal proposed a system by which patients were to gain *"access to health benefits and education"* which would subsequently help one reduce his or her personal "financial burden" to the healthcare provider and to the patient's insurer across a period of years. In general, this was not a category of high priority across submittals.

3.4. Advanced technology utilization

In this category, design attributes most frequently cited, in order of magnitude, were the incorporation of robotic technologies and automatic patient ID protocols associated with facility design (cited in 7 of eight submittals), incorporation of social networking and virtual hospital systems (cited in 5 submittals), and with proposed innovations in hospital construction methods (cited in 3 submittals). The increasing role and importance of advanced technology in the hospital setting was addressed in all but one submittal (S6). The five submittals that made mention of social networking and virtual hospital amenities were focused on mobile health technologies to afford patients and families greater opportunities to self-manage their illness and to communicate more effectively with one's care providers. These narratives stated that through social networking and mobile health technology, the hospital of the future will facilitate diagnosis, treatment, and social networking as a hub connecting care recipient with care provider, to the community, and as a facilitator of educational initiatives in health promotion and healthy lifestyles. While only three submittals focused on innovations in construction delivery methods, several submittal made mention of high-tech Patient ID guidance systems as a means to enhance staff communications with patients and with one another as a means to enhance patient safety:

"(We propose) a personal digital check-in and facility guidance device, a Boarding Device that promotes no waiting, rapid pre-screening, and much more direct interaction with the care provider."—S3

"(We propose) RFID and bar coding for the cross checking of patient identity with care delivery processes, and all products/services."—S8

"Patients are given a unique IT identity which allows them freedom to move throughout the hospital and grounds, freedom from the constraints of traditional waiting rooms (which are not provided) and from traditional boundaries."—S9

"Technological care has begun its movement towards the patient. The New Millennium ushers in genetic testing, nano-robotic diagnostic systems, biologic medication, and integrated evidence-based databases, bringing tech-based care even closer."—S4

3.5. Attainment of carbon neutral facilities and campus

With regards to sustainable design and carbon neutrality, design attributes cited, in terms of frequency of mention, were the incorporation of energy efficient strategies (cited in all 9 submittals), an emphasis on the attainment of a carbon neutral hospital (cited in 7 submittals), and water conservation strategies (cited in 7 submittals). Mentioned less often were biodiverselandscape design strategies (cited in 4 submittals), state of the art waste disposal methods (cited in 4 submittals), public transit linkages to the hospital, indoor comfort control, and the use of a non-toxic material palette (all cited only twice).It is noteworthy that only two submittals made mention of the value of public transit linkages from within the surrounding community to the hospital campus as a means to reduce carbon emissions. Public transport was in general not addressed in S1–S9. However, four submittals cited bio-diversity landscaping in the narrative of their proposal although with varying degrees of emphasis.

To summarize the analysis, the *Small Hospital/Big Ideas* competition submittals expressed many current state-of-the-art facility design strategies. It was somewhat unexpected that some issues were addressed by only a few submittals, i.e., the staff work environment, patient-family and staff circulation patterns, way finding, indoor comfort control, and patient care cost efficiencies. In Figure 1, the most frequently cited design features across the nine written narratives are listed on the left-hand column, with most oft-cited user and organizational outcomes across the nine narratives listed in the right-hand column Similarly, in Figure 2, physical feature information is provided, although here in relation to anticipated staff and organizational outcomes anticipated to be accrued as a function of the built environment as expressed in the nine design proposals. Beyond this, the authors have taken this one step further. Recent relevant research literature is plugged into these two diagrams, for two reasons: first, to coalesce and codify linkages identified in the content analysis between *input variables* (facility design) and *outcome variables* (patient, staff, and organizational issues). Second, to provide a platform for further work on this topic. Such applications might include their utility as a "design tool" within a kit-of-parts for pre-testing and application in the future.

4. A proposed two-stage framework

This comparativeanalysis of the entrants to a competition in the U.S. provides new insight as to how EBR&D can be woven into the fabric of future competitions. Kaiser Permanente, one of the leading healthcare providers as well as innovators in the U.S. healthcare industry, fostered a format that points in the direction of valuing quantitative knowledge as a genuine part of the process because the finalists were contracted to further develop their design on a more rigorous level in a second stage. This format acknowledged clients' need for a more in-depth approach than in the past and against the backdrop that an inherent disconnect still persists in many quarters between EBR&D and healthcare design itself (Kim and McCuskey Shepley, 2008; Verderber, 2010). This gap persists, in part, because the former strongly advocates empiricism while the latter does not (Richardson et al., 2001; Tetreault and Passini, 2003; Norris, 2012).

The recommended protocol is a two-stage model. The first stage embraces the longstanding intuitive model whereby creativity is fostered, unencumbered by technical requirements per se. In Stage 2, the *performance* of the entry becomes the focus whereby the use of EBR&D becomes one of multiple sources of knowledge that is woven into the design. To this end, Figure 1 and 2 can again be of use in this type of a two-stage format, i.e., the relationship between physical environment attributes and patient/family outcomes, and the relationship between physical environment attributes and staff/organizational outcomes. Prior to the start of stage 1, all entrants agree to this format and all are thereby cognizant of its intent, structure, and scope.

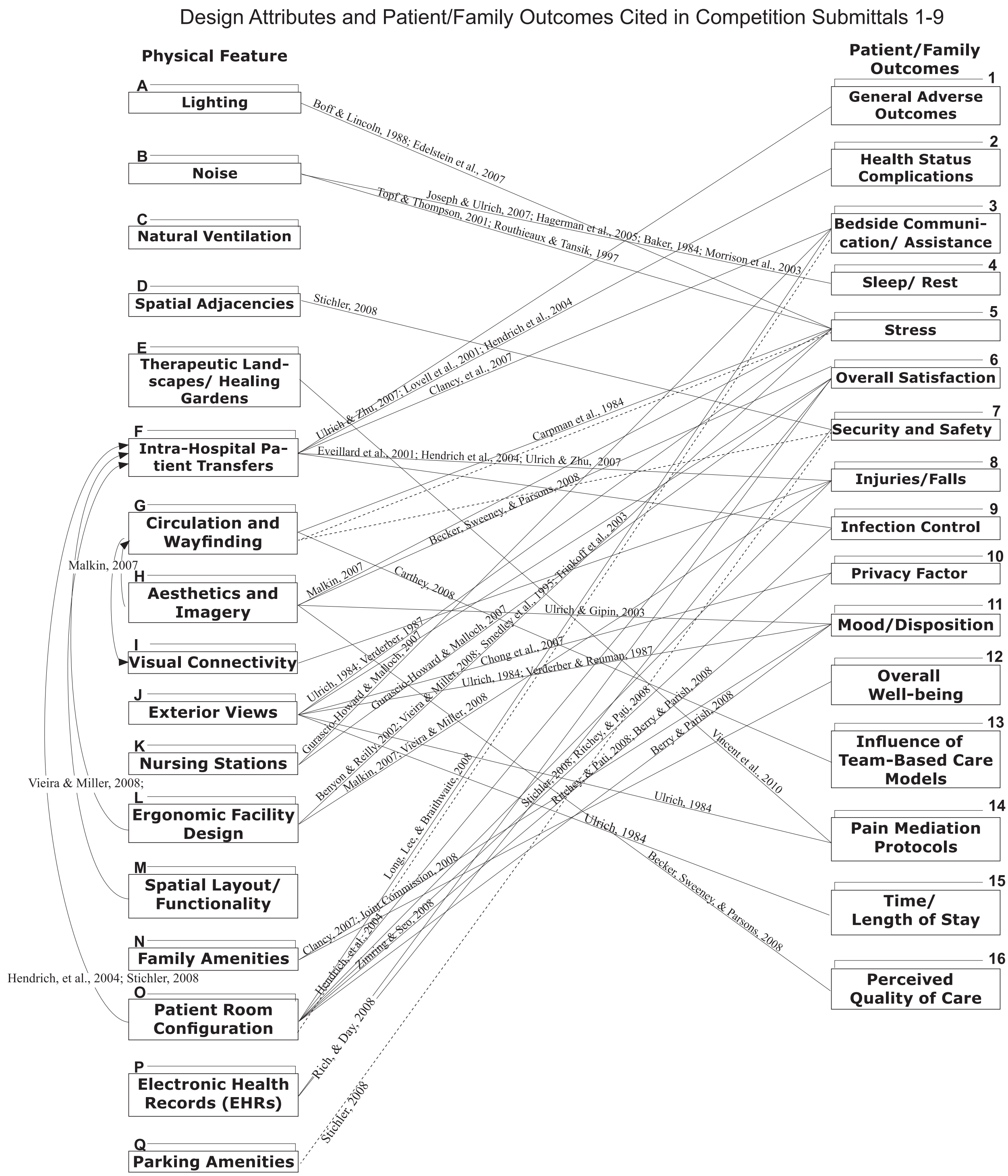

Figure 1 Design attributes and patient/family outcomes cited in competition submittals 1-9.

The recommended steps in at two-stage format are as follows:

Stage 1:

- Competition announcement and request for submittals.
- Participants embark on design process/intuitive concepts generated.
- Translation of concepts into researchable statements of intent.
- Submittal of stage 1 design proposal.
- Selection of stage-one finalists.

Stage 2:

- Translation of design concepts into researchable assumptions and hypotheses.
- Literature review/observation/data acquisition (first-hand and archival).
- Articulation of submittal's performance criteria.
- Proposal for conducting post-construction facility performance assessment.

- Submittal of stage 2 evidence-based design proposal.
- Selection of winner and honorable mentions.
- Feedback loop for appraisal of efficacy of entire two-stage protocol.

4.1. Mitigating traditional biases against healthcare design competitions

This two-stage model holds the promise of mitigating the three reasons stated at the outset of this discussion as to why, traditionally, so few healthcare design competitions are held annually. The first of these centers on the mitigation of dismissive attitudes – longstanding negative biases – that now can be countered by an evidence-based design competition protocol capable of illuminating the central role of occupantwell being and satisfaction (versus an overemphasis on institutional-provider concerns) andthereby furthering the de-institutionalization of the healthcare milieu in society. The second obstacle cited at the outset – a lack of client and philanthropic sponsorship – can now be addressed by demonstrating to potential underwriters, philanthropists, and healthcare provider-sponsors the merits of a value-added return on their investment by adopting an evidence-based protocol within a competition framework. This can manifest in a safer and more productive care setting because the winning entry will now express verifiable evidence-based knowledge in an explicit manner by means of its post occupancy evaluation. In the past, such information usually remained unaddressed. The third problem – which centers on the perceived wishy-washy, open-endedness of competition formats themselves – can now be further demystified and made less threatening, less imprecise, more structured. The client-sponsor can now be equipped with exponentially more detailed, precise construction, cost expenditure, scheduling, and operational performance data than in the past by means of the application of recent advancements in facility design, including BIM (Building Performance Modeling). This will aid in the assessment of client and sponsor ROI.

5. Conclusion—fast forward

One of the most well-known healthcare design competitions of the 20th century resulted in Alvar Aalto's timeless masterpiece, the Paimio Sanatorium in Finland (Spreiregen, 1979). It did not resemble a conventional hospital, as it expressed a completely new paradigm for the treatment of tuberculosis based on its orientation to natural daylight, its wooded site, patients' sustained transactions with nature vis-à-vis extensive exterior rooftop terraces, and multiple places for respite throughout. It expressed many early precursors of what would become core tents of EBR&D, with fundamental emphasis on landscape therapeutics (Watkins and Keller, 2008). Aalto was the first modern architect to infuse "evidence" of this type in a competition design entry in healthcare. It expressed all that was believed could help treat TB patients at the time – natural daylighting, cross ventilation, openness, nature connectivity, fresh air.

Submittals to Kaiser Permanente's recent *Small Hospital, Big Ideas* Competition in the United States were comparatively analyzed (Kaiser Permanente, 2010a, 2010b, 2013; Guevarra, 2012; Planetizen, 2012). Based on the analysis reported above has been argued that EBR&D knowledge can be an illuminating component in a healthcare facility design competition. The adoption of a two-phase model can foster intuitive creativity in a first stage that can be verified in a second, more rigorous "testing" of research hypotheses such as:

> *Electronic patient ID systems can reduce patient waiting times compared to traditional check-in protocols. This will result the in the need for smaller waiting rooms*
> *Incorporating art therapy rooms in the hospital setting can facilitate greater social intercourse between patients, families, visitor and staff.*
> *The provision of a patio or garden adjacent to the patient's room with a door directly accessible to the outdoors will reduce environmental stress and anxiety* versus *rooms that do not provide tis amenity.*

This subsequent verification can guide a systematic post occupancy evaluation after the winning entry is built. The competition therefore becomes a progenitor not only for design innovation, but also for innovative research hypotheses and their verification. At present, the most widely known resource that links existing and emerging EBR&D knowledge with completed case studies and post occupancy evaluations is the Pebble Project (Edelstein, 2008). The Pebble Project is the main research initiative of *The Center for Health Design*. It consists of a database of more than forty free research reports and white papers that link built environment outcomes to searchable databases of relevant research and built projects. The Center's website contains detailed information on completed and in-progress case studies (The Center for Health Design, 2013a, 2013b).

Limitations of the preceding discussion include an inability to adroitly compare and contrast the esthetic content of the visual, non-written material embedded in each submittal. This is because conventional content analysis methodology is dependent upon written texts. In order to develop a comparable lexicon of terms and concepts, it would have been necessary to interpret subjectively the content of the esthetic properties of the more than one hundred interior and exterior renderings, floor plans, and diagrams included within the nine entries. In future research on this topic it is recommended that a feasible method be utilized to interpret the esthetic content of this non-visual material. One such approach might be to assemble a panel of judges to assess and rank order all visual materials, item by item, and to provide descriptive labels, accordingly. This can result is a useful typology of non-written content and can be used to further quantify and illuminate the overall analysis. A review recent research on the topic of the structure of esthetic preferences is also recommended (Wang and Yu, 2012).

Two questions arise: 'How can designers adroitly weave together EBR&D information with esthetic and technical content?' In the case of evidence-awarded architecture for health, 'How can design concepts be "tested" in the constructed project? It can be instructive to take cognizance of the eight steps in the EBR&D process as developed

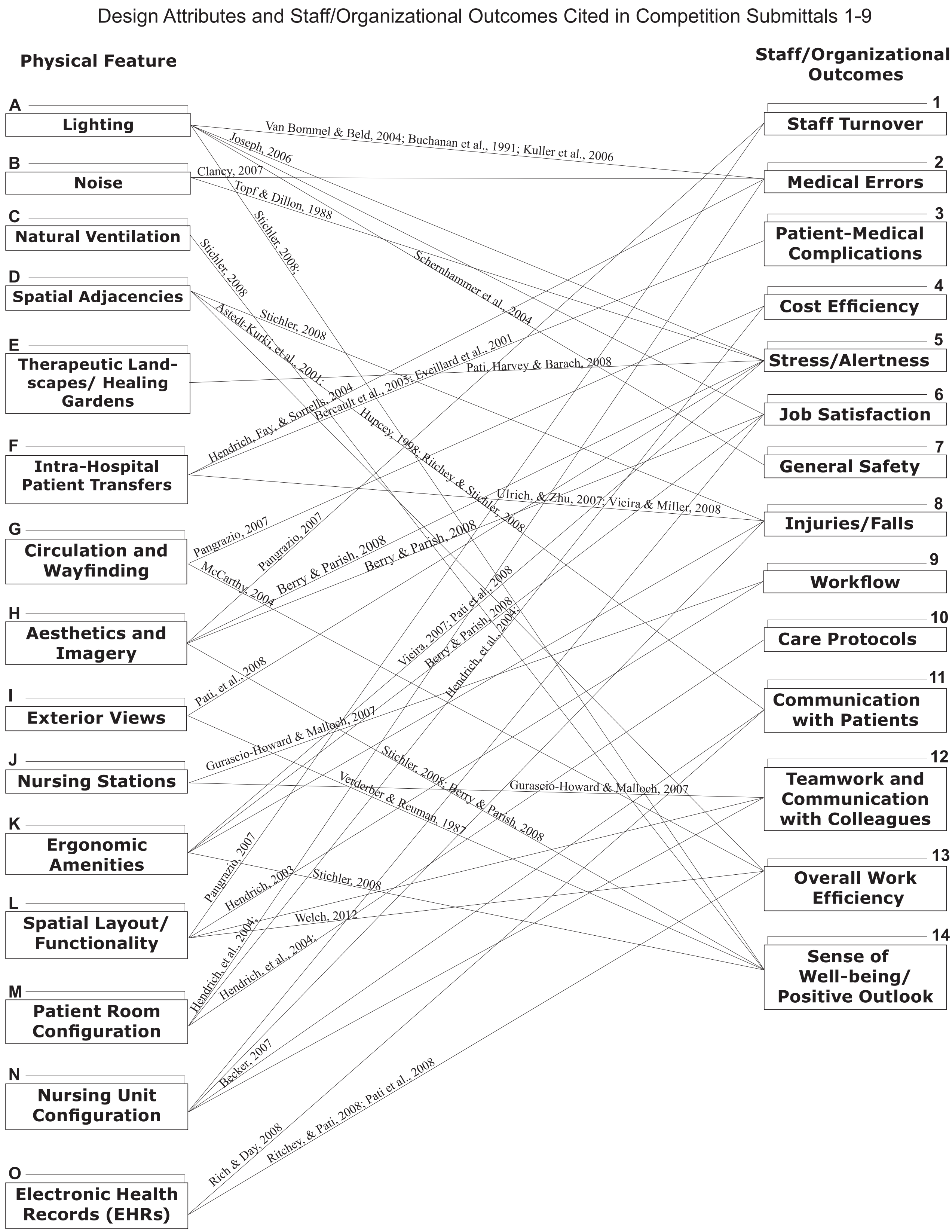

Figure 2 Design attributes and staff/organizational outcomes cited in competition submittals 1–9.

by The Center for Health Design for its EDAC certification program. These steps are (1) Define EBR&D goals and objectives; (2) Find relevant sources of evidence; (3) Critically interpret relevant evidence; (4) Create and innovate EBR&D concepts; (5) Develop a hypothesis or multiple hypotheses; (6) Collect baseline performance measures; (7) Monitor implementation of EBR&D concepts during design and construction; and (8) Measure the built outcome via post-occupancy assessments(Hamilton, 2004; The Center for Health Design, 2013a; Ulrich et al., 2010). These criteria have defined the Pebble Project's aim to advance the movement towards knowledge-based healthcare architecture. With this said, an evidence-based healthcare design competition holds the promise of advancing safer, more functional, ecologically attuned, *and* more aesthetically satisfying healthcare environments.

6. Note 1

The nine submittals expressed a broad span of esthetic and technical approaches. These ranged froma major emphasis on conventional architectural renderings of exterior spaces, interior spaces, site plan, and schematic plans of each floor level, to submittals devoid of exterior or interior architectural renderings but instead opting for detailed conceptual statements accompanied by conceptual diagrams. Five of the nine "architecturally concrete" submittals, however, were sufficiently interpretable by the authors regarding their building design images. The co-winning teams, ADITAZZ, and M+NLB/Perkins+Will (New York), perhaps not coincidentally, provided substantial descriptive visual information in support of written project narratives. ADITAZZ proposed a 36-bed, 4 level facility that featured one large solar panel/energy harvesting apparatus functioning, compositionally, as a single, iconic, and immediately identifiable organizational element, to be clearly recognizable within the community. Various diagnostic and treatment, patient-family support, and administration, are to be housed beneath in interconnected yet decentralized building elements. This *parti'* featured a large open air "Agora" housing a ground level farmers market, concepts, secluded therapeutic as well as more public gardens, and multiple seating areas. Exterior and interior renderings depicted this immense canopy as a large "hanger-like" device that allows natural light to filter through a semi-opaque grid. The other co-winning submittal, by M+NLB/Perkins+Will, was for a 100-bed, 3 level facility. Its renderings depicted a *parti*' comprised of a horizontal arrival element housing administration and patient-family support functions with a connecting spine at its midpoint leading to a pair of mirrored triangular med-surgical units. A one level diagnostic and treatment wing would be located to the right of the two med-surgical pavilions. Numerous exterior and interior renderings were provided, including one of a typical patient room. Next, the submittal by the Smith Group featured a smaller number of perspective views. These depicted a pair of two mirrored (parallel) wings, one of which would be 1 level in height and house administration, central support, and community outreach. To the rear, a pair of 2 level patient housing units would be situated, one of which housing "high acuity beds," and the other "low acuity beds." A fourth submittal, by the firm Gresham, Smith and Partners, was, for lack of a better term, a conventional community "hospital" in appearance and in its spatial organization, based on exterior and interior views, and floor plans, provided. Its main feature would be Central Arroyo Park. This large, open-air courtyard, at its core of the *parti'*, would contain a farmers market, space for outdoor wellness education classes, a rock garden, and performance spaces. At the rear of the site plan, three identically massed (in plan) medical office buildings were depicted. A fifth scheme, by the team of John Cooper Architecture/TBL Architects, consisted of an extensive written narrative but accompanied by images too diagrammatic to be classified as architectural design renderings when compared to the other four schemes described above.

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