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A Semi-Private Revival: Is There a Place for the Semi-Private Patient Room in American Hospitals?

Lindsay Todd

Clemson University, lindsaygtodd@gmail.com

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A SEMI-PRIVATE REVIVAL: IS THERE A PLACE FOR THE SEMI-PRIVATE PATIENT
ROOM IN AMERICAN HOSPITALS?

A thesis presented to the Graduate School of Clemson University in partial fulfillment of the
requirements for the professional degree, Master of Architecture.

Lindsay Gavos Todd

May 2010

Thesis Committee:

David Allison, Primary Advisor

Dina Battisto, Committee Member

Stephen Verderber, Committee Member

Janet Craig, Committee Member

Sandra Garrett, Committee Member

ABSTRACT

Is there a place for the semi-private patient room in contemporary American hospitals? This thesis purposes that the semi-private room remains a viable option for some patient populations and care scenarios, and merits reconsideration and redesign. This inquiry is among few in the literature devoted to advancing semi-private patient room design and application within contemporary healthcare. The semi-private room may yet offer increased opportunities to address pressing issues of increasing healthcare costs, improving operational efficiencies, and reducing the hospital's environmental footprint, while simultaneously attempting to address both longstanding and recent industry concerns with traditional semi-private patient rooms. Further, it will serve as an opportunity to better understand the benefits and limitations for both the private and semi-private patient room models as there remains limited empirical evidence in support of all private rooms in all circumstances.

This study aims to uncover the possible advantages and disadvantages of the semi-private patient room in relation to the private model in order to inform and establish criteria for evaluating and executing applicable and successful semi-private patient room design. Private patient rooms prevail as the preferred model of care in new hospital construction in the

United States today. The 2006 AIA Guidelines for the Design and Construction of Health Care Facilities mandates the construction of all private rooms “unless the functional program demonstrates the necessity of a two-bed arrangement” (Burnette, 2006). As a result, the semi-private patient room has become nearly obsolete, neglecting its potential benefits on the basis of limited empirical evidence in support of the private patient room. This re-evaluation of the semi-private patient room seeks to assess its remaining relevance in certain acute care patient populations today, such as pediatrics, oncology, or whole organ transplant patients.

An extensive literature review was conducted in the beginning of this process to verify the assertions and assumptions made at the outset of this thesis and to ground the study in research and empirical evidence. In order to establish a framework of comparison, several case studies of recently constructed healthcare facilities that utilized the semi-private patient room model were identified. The selected facilities, located in London, United Kingdom, Deventer and Groningen in The Netherlands, were visited in the summer of 2009 and a thoughtful analysis of each was conducted during and upon returning from this tour. An assumption that not all patient populations would be appropriate for sharing a patient room led an investigation to identify which patient care scenarios might benefit from a semi-private room model. Patient populations were evaluated based upon characteristics, such as acuity,

diagnosis and average length of stay. Several scenarios were recognized and deemed most qualified as being appropriate conditions for sharing a patient room, such as pediatric patients, rehabilitation patients and transplant patients. To guide the redesign of the semi-private patient room a set of design guidelines intended to address the particular needs of staff, families and patients sharing a room were identified and modeled after the pattern structure used in Christopher Alexander's *A Pattern Language*.

The final product of this study is a re-conceptualized and redesigned semi-private patient room that encompasses the attributes that make the private patient room a viable model for care, while providing for a more cost and operationally efficient room model with a smaller environmental footprint. To ground this study in an existing care context, the Medical University of South Carolina (MUSC) was selected as the site and operational context for the redesigned semi-private patient room. MUSC is the only hospital in South Carolina that services whole organ and bone marrow transplant patients, therefore the renal transplant inpatient unit was chosen as an appropriate patient care scenario for the redesigned room. The intention of the redesigned room is that it would satisfy, to the fullest extent possible, the design guidelines originally established to inform an improved, more patient-centered and

operationally supportive shared patient room model for the contemporary American
healthscape.

DEDICATION

This thesis is dedicated to my husband, my best friend, and my biggest fan, Preston. Without your unfailing love, patience, support and encouragement in the toughest hours, I could not have done this.

I also want to dedicate this thesis to my dad, my mom, and my sister. I would not be who I am today without the three of you believing in me and encouraging me for the past 27 years of my life.

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To Dave, my primary thesis advisor, for seeing potential in me I didn't know that I had and pushing me beyond what I thought I was capable of doing.

To Stephen, a member of my thesis committee, for exuding a passion that inspired me to challenge and question what I thought to be true.

To Dina, a member of my thesis committee, for investing not only in this journey, but also giving time she didn't have to offer a mother's heart when it was needed.

To the rest of my thesis committee, Janet and Sandra, thank you for your dedication and commitment to seeing this project reach its potential.

To my classmates and the best friends I could have asked for these past two years, Christine, Josh and Lin, for being my home away from home.

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INTRODUCTION



1. A traditional semi-private patient room.

In American healthcare facilities today, the semi-private patient room has become nearly obsolete with almost all attention focused on the benefits and design refinement of the private patient room. This recent and dramatic shift in patient care can be attributed to ongoing concerns mentioned in the literature, but it has been strongly advocated for through the mandate given in the 2006 AIA Guidelines for the Design and Construction of Health Care Facilities. The Guidelines dictate that all new construction hospitals incorporate the all-private patient care unit “unless the functional program demonstrates the necessity of a two-bed arrangement” (Burnette, 2006). Coinciding with this firm recommendation by the AIA Guidelines is the unprecedented growth of hospital footprints in the contemporary American healthscape. Latimer et al. recently brought to light the remarkable growth which has occurred in healthcare over the past 20 years (Latimer et al., 2008). Patient rooms alone have assumed a 77% increase in net square footage bringing the average space required to care for a patient in new hospitals today to 320 NSF (Latimer et al., 2008). And, while the United States has seemingly deemed the semi-private patient room unfit for patient care in new hospitals today, the semi-private patient room model still remains a standard form for care delivery in healthcare facilities in nations around the world, suggesting the potential for comparable positive patient outcomes within this model. This study aims to uncover the advantages and disadvantages of the semi-private patient room in relation to the private

	2007 AVERAGE (MEAN)	20-YEAR INCREASE
Patient Rooms	320 NSF	77%
Total Adult Acute Bed Space	720 DGSF per bed	118%
Total Adult Critical Bed Space	900 DGSF per bed	N/A
Operating Room/Image-Guided	704 NSF	53%
Total Interventional Space	3,700 DGSF per suite	45%
Magnetic Resonance Imaging Room	810 NSF	(13%)
Computed Tomography Room	620 NSF	22%
Positron Emission Tomography Room	718 NSF	69%
Radiography/Fluoroscopy Room	370 NSF	28%
Nuclear Medicine Room	385 NSF	49%
Ultrasound Room	150 NSF	4%
Total Imaging Space	1,750 DGSF per key room	33%

**2. “Are We Super Sizing Healthcare?”
(Latimer et al., 2008).**

model in order to inform and establish criteria for evaluating and executing successful semi-private patient room design.

The notion of sharing a room while receiving healthcare has in reality dominated patient care throughout history; in fact, not until recently did the private patient room become a common form. A reconsideration of the history of patient care reveals the semi-private patient room as a relevant, effective, and efficient model for care delivery today as it was then. However, today's semi-private patient room must respond to a growing list of concerns, many of which did not exist or were not deemed significant until recently, including patient privacy, patient control over their environment, medical errors, and perhaps the most commonly cited, infection control. It is critical to be rigorous researching and understanding these concerns from existing literature, as well as, methodical in addressing these concerns in the redesign of a semi-private patient room. These ongoing concerns facing patient care today are important; however they should not serve as the only driver in determining the most appropriate patient room model for care delivery in all patient care scenarios. The current increase in hospital footprints in healthcare today is a real cause for concern, and demands consideration as well. Current trends in healthcare today include the rising cost of healthcare, the ever-increasing size of the nursing unit in turn contributing to the greater travel distances

experienced by staff, and the growing carbon footprint of contemporary hospitals. It is these concerns that should also motivate the need to re-evaluate the direction America is taking healthcare.

The semi-private patient room has the potential to remain a relevant and viable model for certain patient populations and care scenarios, and is not being considered or suggested in this thesis for all circumstances. Some patient populations, either because of their age, acuity, or length of stay, might be more appropriate applications than others, potentially even benefitting from a semi-private patient room model. The social support that patients sharing a semi-private room could provide to each other from the perspective of another person undergoing a similar experience cannot be underestimated or dismissed. To be certain that design goals, such as socialization and support, be considered in the redesign of the semi-private patient room, a list of design guidelines was developed to aid in the redesign of the room and to serve as a measuring stick with which to evaluate the proposed semi-private patient room design. The successful redesign and appropriation of the semi-private patient room in contemporary American healthcare will respond to and be a product of: a critical reconsideration of the past, a thorough re-evaluation of the present concerns facing the semi-private patient room model, a desire to see the current trends in healthcare toward larger



3. A modern megahospital.

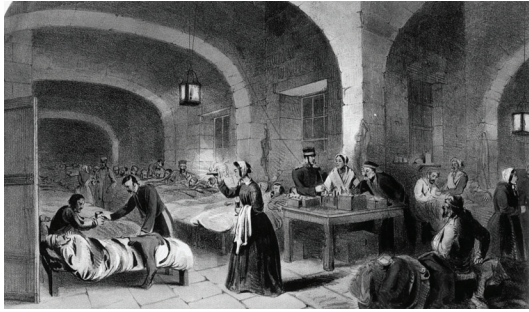
footprints tempered, a careful requalification of the room's application within American hospitals today, and a thoughtful re-conception of the semi-private patient room.

Contemporary hospitals represent an unsustainable model, not only in terms of carbon footprint and resource consumption, but they are also becoming economically and operationally unsustainable in an era of constrained human, economic and environmental resources. From an environmental standpoint, healthcare architecture continues to lag behind in the implementation of green design principles that guide the remainder of the building industry. Ever-increasing building footprints result in higher material and energy demands, consuming more in an era of less. Healthcare buildings, although only 3% of commercial square footage in the United States, represent 11% of all energy consumption within that building type, the fourth highest consumer of all building types (<http://www.aep.uci.edu/>). The all-private patient room mandate is an inherent contributor to increasing hospital footprints, which intrinsically affects the overall environmental or carbon footprint of healthcare facilities. In addition, larger buildings also inherently contribute to the escalating cost of hospital construction (\$16 billion in 2004) translating into increased healthcare costs ultimately transferred to society (Babwin, 2002). An analysis of ten nursing units with varying configurations, some featuring exclusively private patient rooms and some

a combination of private and semi-private rooms, utilizing equal construction cost per square foot found that in a private patient floor plan first costs averaged \$182,400 per patient, relative to \$122,550 per patient in mixed private and semi-private room arrangements (Malkin, 2008). While difficult to quantify precisely, growing building and, more specifically, growing inpatient unit footprints also increase operational costs associated with patient care as staff must travel sometimes twice the distance to reach the same number of patients on an all-private patient care unit. Expanded building footprints not only affect the cost of care but also place higher demands on a diminishing nurse population by increasing care task time and effort and complicating patient care. It is common to see an aging nursing staff, averaging 43 years of age (Ulrich et al., 2004), caring for more patients at higher acuity levels in today's hospitals. The all-private patient room nursing unit is inherently more spread out requiring greater travel distances for nursing staff to care for a given number of patients. And, the more time nurses spend moving between patients the less time and energy they have to dedicate to bedside care of their patients.

By contrast, the semi-private patient room inherently creates a more compact nursing unit; yet nearly all attention has been turned away in favor of the private room. Design trends as well as current literature and research focus wholly on the benefits and refinement of the

private patient room, entirely neglecting the potential care benefits of the semi-private room. Evidence cited in support of the private room, including infection control, medical errors, and privacy, remains relatively limited and largely opinion-based (Ben-Abraham et al., 2002; Chaudhury et al., 2005; Delaney and Gunderman, 2008; Van de Glinde et al., 2007), calling into question the validity of the total abandonment of the semi-private model. Furthermore, the semi-private room and, indeed, multiple-patient wards remain standard forms in healthcare facilities in developed nations around the world, including many countries where positive patient outcomes are comparable or better than in the United States where private rooms are becoming the dominant model. While some studies (Ben-Abraham et al., 2002; Cepeda et al., 2005; Kibbler et al., 1998) suggest improved nosocomial infection rates in private rooms, the evidence remains inconclusive and it “is partly attributable to the complex, multifactorial nature of these infections. This makes it difficult to perform controlled trials in this area” (Dettenkofer et al., 2004). And, while most of the literature supports the private patient room, one recent study found that “a positive aspect to sharing a room was highlighted by comments (from patients) that ranged from a sense of support proffered after discussions with the health professional to companionship in an otherwise lonely environment” (Malcolm, 2005).



4. Florence Nightingale caring for soldiers at Scutari.

A look back into the history and evolution of patient care as experienced today reveals that sharing a room while receiving healthcare has in reality dominated patient care models throughout history; in fact, not until recently did the private patient room become a common form. Florence Nightingale introduced revolutionary ideas and a new, innovative thinking that altered the delivery of patient care and forever changed nursing unit design. Many of her influences are still visible in healthcare facilities today, including an emphasis on nursing and unit efficiencies as well as the importance of natural daylighting and its effect on the healing process. Nightingale's primary concern was that the nurses that staffed each ward, or inpatient unit, were provided with the optimal care environment and the tools they needed to adequately care for their patients. And, it was her recommendation that for nurses to be able to provide the best care to their patients, the patients themselves must remain as visible and as accessible as possible, which meant having them in a single, shared location free from visual barrier. The typical Nightingale ward housed up to 32 patients on a single ward and reserved the private, isolated rooms for only the sickest of patients. It would be remiss not to reconsider what we understand today as inpatient nursing care and where it began, how it has evolved from multi-bedded wards to private rooms, and the elements that have remained constant throughout time to better understand the evolving rationale for greater privacy and to predict the trends for hospital room design and inpatient care in the future.

The ramifications of the design decisions made today will be experienced for decades to come, particularly in the realm of healthcare architecture as the typical hospital remains in use for an average of fifty years. While a growing body of literature begins to indicate certain merits of private patient rooms, a direct correlation has not yet been established between private rooms and patient outcomes (Ben-Abraham et al., 2002). Nor has any attempt been made to re-examine the semi-private patient room in consideration of the potential advantages it may offer for patient care, social support and resource commitment. Nearly all current literature focuses exclusively on the benefits, real or perceived, of the private patient room. A variety of issues currently contribute to the rationalization of the decision to exclusively design and build private patient rooms, among them infection control, medical errors, efficiency, patient control of their environment, family accommodations and privacy. There remains a need to determine the advantages and disadvantages of private and semi-private patient rooms in order to inform a more complete view of their role within the healing environment.

The primary intention of this architectural proposal is to redesign the semi-private patient room in order to address and challenge as many of the issues presented above as possible through design. By establishing a set of design guidelines for the successful redesign of a



5. A site visit to the Martini Hospital in Groningen, The Netherlands.

semi-private patient room for contemporary American hospitals, the room can be evaluated against these design goals set in place from the beginning of the process. In addition, this study aims to achieve a more thorough understanding of the perceived and actual advantages and limitations of private patient rooms to reveal the patient care scenarios in which semi-private patient rooms may be more appropriate. These findings would in turn inform a redesign of the semi-private room to incorporate the positive elements of each patient room model, potentially contributing to more economical and environmental sustainable contemporary hospital design.

To gain a more complete understanding of the semi-private patient room and the multi-bedded ward still used in many international healthcare settings today, it proved very beneficial to see these rooms first-hand, to speak with the staff that care for patients in these rooms personally and to inquire of the patients themselves as to their opinions on sharing a patient room. The opportunity to view and analyze the various multi-bedded patient room models directly was essential to the research and case study analysis and aided in informing and developing a set of design guidelines that are used to inform and evaluate a more successful semi-private patient room design. These design guidelines considered patient room features such as room size, views and natural light, personal space, family niches,



6. Front entrance of the new MUSC Ashley River Tower.

corridor visibility, and flexibility and adaptability to list a few. Filtering and selecting the appropriate patient populations was imperative to the success of the re-implementation of the semi-private patient room model into today's healthcare facilities. By defining a set of attributes that distinguished patient populations more suited for sharing a patient room, such as a patient's age, condition or length of stay, an array of patient care scenarios emerged as being more qualified for a semi-private patient room model, including pediatrics, oncology, rehabilitation, and certain transplant patients.

The site chosen for this thesis exploration is a renal transplant inpatient unit at the Medical University of South Carolina in Charleston. Whole organ transplant patients were recognized as a patient population that might actually benefit from two patients sharing a room. The average length of stay of organ transplant patients before, during, and after surgery for recovery and rehabilitation is much longer than other patient care scenarios. Longer lengths of stay provide patients who might be sharing a room the opportunity to really benefit from the development of a relationship with a roommate, giving one another support to endure the longevity of their condition and hope that they have the potential to recover. The current unit at MUSC is comparable to the industry standard area (320 S.F.) per bed and utilizes exclusively private patient rooms throughout. The architectural solution of a redesigned semi-

private patient room will not only have its success evaluated against the defined design guidelines, but it will also be assessed within the context of this nursing unit to determine if the utilization of this patient room model improves issues such as travel distances for nurses or the departmental gross square footage per patient (which has a direct impact on cost).

Irrespective of the measured success of the redesigned semi-private patient room, this study is among few devoted to examining semi-private patient room design and its application within the contemporary healthcare system. It attempts to address pressing issues of healthcare costs, sustainability and operational efficiencies. In addition to a redesigned semi-private patient room it is expected that this thesis will aid in confronting the perceptions people may have of the semi-private patient room, be they aesthetic, experiential or functional, grounded or mere perceptions founded in opinion. It also attempts to illustrate design possibilities that have yet to emerge from this neglected patient room model. Within the framework of the global issues at hand in the twenty-first century, a period newly cognizant of the urgency of adopting a more sustainable approach to the future, healthcare architects have a responsibility today to consider their role within the industry to ensure the sustainability of the contemporary hospital – from an environmental perspective but also with a social, economic and functional view. As patient rooms form the basic element of any

hospital, a re-evaluation of the evidence supporting the all-private patient room care unit, and in turn a re-conception of the role and design of the semi-private patient room within the hospital of the twenty-first century signifies an important step toward an improved yet more sustainable model for patient care.

[RE]CONSIDER the past



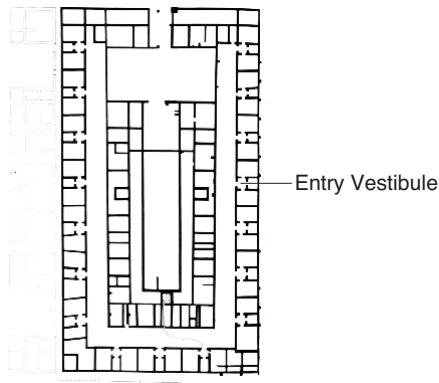
7. Illustration of the Roman barracks.



8. Model photograph of the Roman barracks.

The notion of sharing a room while receiving healthcare has in reality dominated patient care models throughout history; in fact, not until recently did the private patient room become a common form. And while the architecture of the patient room has undergone numerous changes over the years, the basic physical act of caring for a patient at their bedside has remained relatively constant. Undeniably, the technology and technique of bedside care has changed significantly, whereas what has stayed the same is the provision of basic human needs. Therefore, a reconsideration of the history of patient care may help reveal the semi-private patient room as a relevant, effective, and efficient model for care delivery today as it was then.

Privacy in the deliverance of patient care has been considered, and even emphasized, for centuries. In the 1st century A.D. Romans converted and adapted military barracks into a series of three- and four-person patient rooms arranged around a courtyard in order to treat wounded soldiers. These rooms were remarkable for the degree of privacy they offered, and it has been suggested that this idea carried over from the emphasis placed on privacy in the residences of the Romans in which the owners desired a level of privacy from the considerable staff of slaves that slept under the same roof (Thompson and Goldin, 1975).



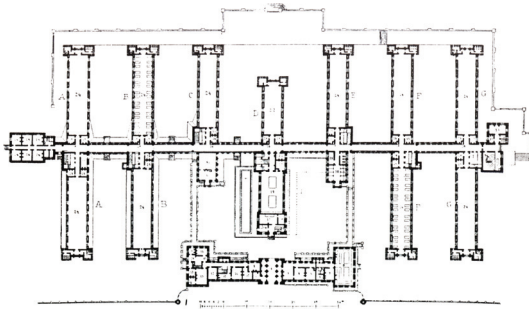
9. Roman barracks plan.

The patient rooms were not entered directly off of the courtyard but instead through a shared vestibule located between every two rooms. This vestibule allowed for a reduction in noise and an increase in privacy from activity that might be taking place in the corridor or hospital beyond (Thompson and Goldin, 1975). And while it was certainly recognized even amongst the Romans, it is even more apparent and true today that privacy matters to people. The success of the redesign of the semi-private patient room will depend almost wholly upon whether or not varying degrees of privacy can be accommodated for each patient sharing a room.

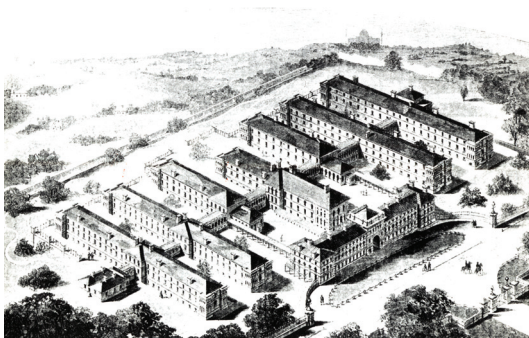
Although the Roman barracks were successful and even progressive in some of their inherent design provisions, they did not, however, address the qualities of the environment in which care was being provided and how those characteristics might affect patient outcomes. Thompson and Goldin recount that the rooms were “remarkable for the degree of privacy they offer” (Thompson and Goldin, 1975). However, the multi-bedded patient rooms from the Roman barracks did not attempt to design for daylight and views to nature or care efficiency for those bestowing care. They did nevertheless serve to provide a foundation upon which patient care could begin to inform from.

The pavilion hospital was an early attempt to thoughtfully design a hospital (comparable to what it is today) considered the qualities of natural light and adequate cross ventilation throughout the patient ward of primary importance. Daylight was critical for delivering patient care before the advent of electric lighting. Ventilation and the movement of outdoor air was a priority in the effort to address sanitation and the spread of disease on the patient ward. The pavilion hospital provides an early example of a designed plan. During the time of caring for soldier patients in improvised settings and less than ideal circumstances, experience often rendered new knowledge and insight into the impact that certain settings and environmental conditions had on patient outcomes. This insight carried over into the first design attempts of the pavilion hospital.

“It might often happen that the hospitals of an occupied town would be filled to overflowing while casualties were still being brought in. They had to be put somewhere; they were piled in barns or deposited on haylofts. The astonishing thing was that the patients in the barns, exposed to cold and inadequately attended, were the ones who recovered... [thus] experience has convinced us that air more than warmth is requisite.” (Thompson and Goldin, 1975)



10. A typical floor plan of a pavilion hospital.



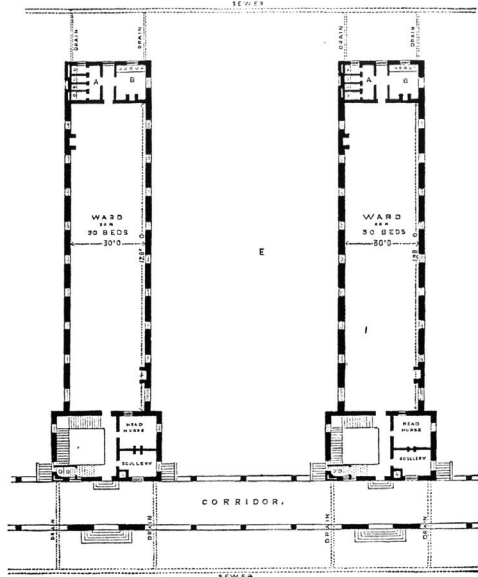
11. An axonometric illustration of a pavilion hospital.

Decisions made about access to daylight and natural ventilation in the design of the pavilion hospital were supported by experiences which had proven successful in providing better patient outcomes than what was currently being employed. This idea can be compared to modern day's "evidence-based design," taking what has shown to be effective and allowing such insight to affect design decisions henceforth. The redesign of the contemporary semi-private patient room must be influenced by existing empirical research studies and evidence. For example, many studies have shown the impact that natural daylight and views to nature have on patient stress and recovery rates in the hospital, as was predicated in early pavilion hospital designs. It can be assumed then that contemporary multi-bedded rooms must provide optimal and equal access to daylight and opportunity for views to nature for each patient.

While the pavilion hospital provided many of the first thoughtful and designed features to patient care, placing importance on natural light and fresh outdoor air circulation, there was vast room for improvement for this particular ward model. Prescribing narrow pavilion-like patient wards spaced far enough apart to allow adequate natural light and ventilation to penetrate, Florence Nightingale refined the open ward plan with the aim to streamline staff efficiency and effectiveness in an effort to maximize levels of care. In order to provide for an



12. A typical Nightingale ward.



13. A typical Nightingale ward plan.

efficient care environment, emphasis was placed on the ability for the staff to observe and have sightlines to multiple patients simultaneously and the fluid movement of care between them. Nightingale, in fact, “could not conceive of an exceptional case that would fare better in a small room. The very sick and the dying she would place in the large ward right next to the nursing station, where they would receive the most attention” (Thompson and Goldin, 1975). The single, cellular, private patient rooms of today have moved away from these ideals. Today’s patient room design is often intended to be “patient-centered,” rather than placing primary importance, as Nightingale would have, on “patient-care-centered” design. A reconceived semi-private patient room for a contemporary American setting should aim to incorporate both patient-centered care along with a reinterpretation of Nightingale’s original design recommendations, which sought to optimize staffing efficiencies for improved patient care.

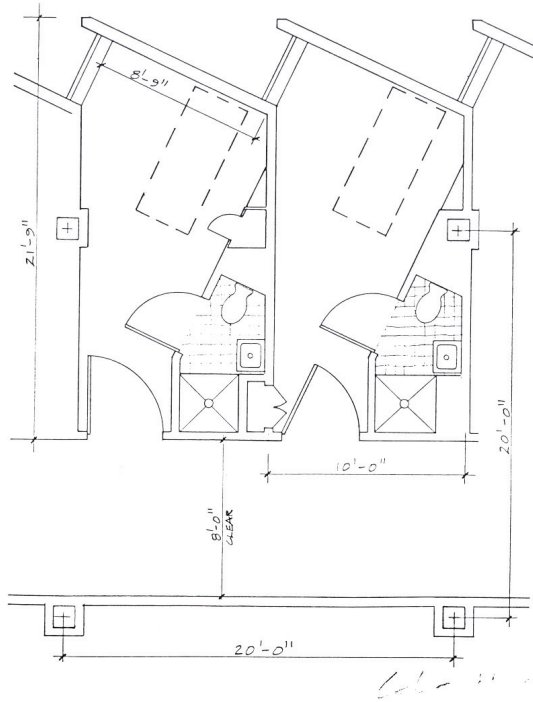
While it may be difficult to trace Nightingale’s full impact on inpatient unit design in American healthcare facilities today, her influence did continue to be felt well into the twentieth century, as hospitals both in Europe and the United States adopted the Nightingale ward concept in their facility planning and design. Rapid transition in patient, and patient care, expectations and perceptions brought the death of the Nightingale ward in the United States, first moving



14. The modern aesthetic characteristic of hospitals from the Hill-Burton era.

inpatient units to smaller ward sizes of eight to ten beds per patient ward. It was not long at all, however, before these smaller patient wards were on their way out, being replaced by six- and four-bedded patient rooms, soon shifting to what became the standard for many years, a mixture of private and semi-private patient rooms. “At the beginning of the [twentieth] century privacy had been the privilege of the well-born or those who could pay well” however the desire for privacy quickly evolved into an expectation among everyone, including the rich, the poor, and the middle class (Thompson and Goldin, 1975).

“In the United States, the passage of the Hospital Construction Act of 1946, commonly known as the Hill-Burton Act, set the stage for four decades of health facility construction” (Verderber and Fine, 2000). The Hill-Burton Standards were meant to offer healthcare architects and planners as well as communities “preset floor plans, room arrangements, bed capacities, and minimum standards for diagnostic and treatment departments” ensuring both the content and the quality of the facility (Verderber and Fine, 2000). The minimum standards put in place by Hill-Burton suggested a ratio of single- and multi-bedded patient rooms of one-third private rooms, one-third semi-private rooms, and one-third four-bedded patient rooms (Thompson and Goldin, 1975). This proportion would not stand or be appropriate in



15. Patient room plan from St. Mark's Hospital.

every circumstance however it was generally accepted to be the ideal combination (Thompson and Goldin, 1975).

And while the Hill-Burton era sustained popularity and relevance for many years, it eventually met its demise and eventual end in the late 1960s and 1970s (Verderber and Fine, 2000). Simultaneously, a new trend towards privacy in the patient rooms was emerging and gaining momentum. In May of 1973, St. Mark's Hospital, designed by Kaplan/McLaughlin/Diaz (KMD), began construction in Salt Lake City, Utah boasting all-private patient room nursing units. Extensive study and research was conducted to discover the optimal arrangement of the nursing units, evaluating and comparing travel distances and overall departmental gross square footages. The goal was to minimize the increase in unit departmental gross square footage and travel distance for all-private room units when compared to semi-private and mixed room units common at the time. In the end, the case for the triangular nursing unit was made and implemented into St. Mark's Hospital. Even more unique and progressive than the nursing unit design was the use of all-private patient rooms.

“An individual room which combines restful privacy and manageability is the essence of the ‘single-care’ concept. Each fully carpeted room has its own impressive view of

the surrounding mountains, a private bath and modern furnishings. Independent thermostat control for temperature is an additional feature of each room – as well as oxygen and vacuum piped directly to the patient’s bedside.” (KMD)

These very small private rooms eventually proved difficult for the provision of contemporary care with an increasingly acute patient population and the accommodation of visitors without conflicting with care giving. Access around the bed was particularly limited for care giving, transfers, and family. While a worthy effort to implement all private rooms with minimal growth in floor area, newer private rooms quickly became increasingly larger.

All-private patient room hospitals still were not the standard. Most hospitals in America during the 1960s, 1970s and 1980s offered a combination of both private and multi-bedded patient rooms. During the 1980s however the healthcare climate shifted and the beginning of what would continue to be an ongoing debate over privacy really took root in America. As a result, hospitals across the nation who had been caring for patients in both private and semi-private patient rooms began the renovation process of transforming semi-private patient rooms into private room models. These rooms were inherently smaller than the designed private patient rooms, and while this transformation process was the dawn of a new era, hospitals quickly



16. The Planetree Unit at Pacific Presbyterian Medical Center.

recognized the need for more space in these renovated private patient rooms to adequately be able to deliver care.

The 1980s and 1990s brought about an even more dramatic transition in hospital design and construction as more and more research was being done, helping to inform the design considerations of the patient care environment. Planetree, a nonprofit, consumer-oriented healthcare organization, was founded with the goal of envisioning and realizing an “ideal healing environment by approaching hospital care in a manner that maximized the involvement and participation of the patient and family” (Verderber and Fine, 2000). The first hospital to adopt the Planetree ideals dedicated only a 13-bed unit out of the 310-bed specialty hospital, located in San Francisco (Verderber and Fine, 2000).

“In a small section of a moderately sized hospital in San Francisco, a quiet revolution is taking place. Gone is the typical sanitized hospital décor – cold aluminum and stainless steel, and linoleum, fluorescent lights, and hard, painted surfaces. Instead, the design aesthetic is comfort and hominess: wood, carpet, and incandescent lights. Gone, too, is care that often best can be characterized as dehumanizing,

depersonalizing, frightening. In its place are friendly congeniality and highly personalized attention... So far, it has been a resounding success.” (Greer, 1986)

The emphasis toward patient-centered care began with Planetree and is still considered a priority among hospitals and healthcare designers. The patient-centered care movement resulted in more amenities and accommodations for families in the room, requiring the need for more space in the room. Currently in the United States, almost all new hospitals feature exclusively private patient rooms for all patient care scenarios throughout the hospital, in part as a response to the emphasis on both increased family involvement and patient control over their environment, both driven by a commitment to patient-centered care.

Hospitals today have grown exponentially in size and spatial complexity as patient care has simultaneously grown increasingly specialized and the private patient room now prevails as the preferred setting for this patient care to occur. Latimer et al. quantifies this unprecedented growth in the patient room specifically over the past 20 years to be 77%, arriving at an average net square footage of 320 S.F. per private patient room (Latimer et al., 2008). While the patient room has undergone significant growth, the nursing unit has experienced an even more exaggerated increase of 118% over the past 20 years, bringing the total adult acute



17. An example of a contemporary pediatric patient room.

care bed space to 720 D.G.S.F. per patient bed (Latimer et al., 2008). This dramatic spatial increase warrants a re-examination of the rationale that has been driving patient room design. The United States specifically has experienced a rapid shift in the context within which patient care is delivered over the past century as the Nightingale wards have become extinct and six- and four-bedded wards entirely phased out of American hospitals. This movement seems driven by numerous variables including a concern with the awareness and rise of nosocomial infections, an age of consumer-driven healthcare, new guidelines and provisions for patients' right to privacy, the patient-centered care movement, as well as the emergence of some supporting research as to the benefits of private rooms on patient stress measures, health outcomes and safety.

Today, the private patient room prevails in the contemporary American inpatient healthscape, and a dramatic transition is finding the semi-private patient room on its' way out of hospitals across the United States in favor of exclusively larger, private patient rooms. Empirical evidence cited in support of the private room, including infection control, medical errors and privacy, remains relatively limited and largely opinion-based, calling into question the validity of the abandonment of the semi-private model. Furthermore, the semi-private room and, indeed, multiple-patient wards remain standard forms in healthcare facilities in nations around

the world, suggesting possible positive patient outcomes within these models. For instance, hospital facilities in The Netherlands, where multi-bedded rooms are the norm, are achieving infection control rates as low as 3%, compared to the national average here in the United States of 4.5% (van Bentem et al., 2008). The call to reconsider this abandoned patient room model is motivated by the assumption that within this patient care model lies the possibility for a redesigned semi-private patient room to emerge and provide a more efficient and sustainable solution for the contemporary American hospital.

[RE]VERSE the current trends

American hospitals as they are typically designed and operated today represent an environmentally, economically and operationally unsustainable model within the contemporary healthscape. The growing trends in healthcare today warrant concern and should be a loud cry to healthcare architects across the United States to reconsider the direction hospital design is taking. Stepping back to look at the picture at large reveals a pressing need to reverse course and slow the spiraling trends toward the dramatic increase in the space required to care for a patient, the ever-increasing cost of healthcare, and the growing travel distances across inpatient units. These trends inherently contribute to the quality of care delivered as well as impacting the operational cost of the hospital. The phasing out of multi-bedded patient rooms in favor of private patient rooms exclusively is a significant contributing factor in these trends. Could a redesigned semi-private patient room make its way back into American hospitals and contribute to a more sustainable healthcare model?

Private patient rooms demand significantly more space per patient than semi-private rooms and result in higher first costs per bed. An analysis of ten nursing units with varying configurations, some featuring exclusively private patient rooms and some a combination of



18. A larger, more lavish private patient room.

private and semi-private rooms, utilizing equal construction cost per square foot found that in a private patient room floor plan first costs averaged \$182,400 per patient bed, relative to \$122,550 per bed in mixed private and semi-private room arrangements (Malkin, 2008). Translated across an entire facility, Berry estimates the total additional cost of building larger, private patient rooms for a 255 bed replacement hospital to be \$4,717,500 (Berry et al., 2000). Over the past 20 years, an astonishing 118% increase in total adult acute bed space has heightened the inpatient departmental gross square footage per bed to an alarming 720 square feet for a typical adult acute care inpatient unit in the United States. In 2007 private adult acute care patient rooms were averaging 320 net square feet, revealing an equally excessive rate of growth of 77% in the last 20 years (Latimer et al., 2008). Evidently, the most apparent drawback to the all-private patient room unit is its size; inherently, private patient room unit configurations result in a footprint effectively twice as large as a traditional semi-private unit that accommodates the same number of patients.

And with increased footprints, private patient room units require nurses to travel greater distances to monitor fewer patients whilst semi-private patient care units by comparison reduce nurse travel distances for patient surveillance and access, thereby potentially streamlining care and response times. A nurse will travel an average of 15 feet of corridor per



19. A view from the corridor into a private patient room.

bed compared to conventional semi-private patient room units which average only 8 feet of corridor per patient bed (Malkin, 2008). A redesigned semi-private patient room should aim to achieve shorter travel distances than the all-private patient care unit. However, it might be unrealistic to assume travel distances to be as low as 8 feet of corridor per patient bed if improved semi-private room design is to be achieved. The implications of increased travel distances and greater separation of patients within the context of an era of nursing shortages raise doubt as to their pragmatism as indeed, in actuality, patient safety may be compromised. Research demonstrates that strains on nursing staff lead to higher turnover rates (20% per year as of 2002) resulting in an overall shortage of nurses in the United States that directly relates to the quality of patient care and safety. Incidentally, the stresses and strains experienced by nursing staff is not only a cause for higher turnover rates, but it is also the product of higher turnover rates as new incoming staff often requires initial training and introduction to the unit as well as more attention from existing staff on top of their shift duties and demands.

One of the more convincing arguments driving the transition to all-private patient room units is the inherent efficiencies the private room model brings to a nursing unit and its staff. Operationally, the private patient room does not limit room assignments, thereby allowing a

hospital to achieve almost 100% occupancy. The need to assign patients to rooms according to sex or diagnosis remains a limitation of the semi-private patient room and must be acknowledged as inherent to the room model. Anecdotal evidence suggests that an occupancy rate of approximately 85% might be attained utilizing a combination of both private and semi-private patient rooms across a nursing unit. Additionally, private patient rooms eliminate patient transfers due to infections and personality conflicts thereby lowering the risk of patient infection during transfer while reducing associated demands on staff as well as the risk of confusion caused by patient relocation. It is equally important and valued in this study to understand and acknowledge the real and perceived limitations to the traditional semi-private patient room. Bringing the issues to light hopefully will inspire innovative solutions in the semi-private patient room redesign, making the semi-private patient room an even more successful model for efficient and effective patient care.

The move towards exclusively private patient room construction compromises the ability to minimize the environmental footprint of hospitals and hospital construction. Furthermore, energy consumption, once the construction is complete, is really only one dimension of the environmental footprint of a building. The embodied energy of material extraction, transportation, manufacturing, and construction must also be considered as impacting the



20. An expansive hospital campus.

overall carbon footprint of a hospital. The private patient room mandate stipulated in the 2006 AIA Guidelines, inherently requiring more building envelope, structural framing and mechanical systems, interior finishes and furnishings, has not only increased the size of the building footprint, but has also negatively affected the increasing carbon footprint healthcare represents. The built environment has been exposed as one of the greatest culprits, responsible for 72% of the electricity and 13.6% of the potable water consumed annually as well as 39% of the carbon dioxide emitted into the atmosphere each year, contributing more than either transportation or industry (www.usgbc.org). Healthcare buildings, although only 3% of commercial square footage in the United States, represent 11% of all energy consumption within that building type, making it the fourth highest consumer of all building types (www.apecp.uci.edu). The demands hospitals place on the environment are necessarily greater than other building types, using more energy to construct, operate and maintain, due to their highly specialized and intensive use. Unique issues facing healthcare designers, builders and professionals include the 24/7 hours of operation, the intense energy and water use, chemical usage, as well as infection control requirements placed upon the facility. However, the requirement for all-private patient room care units only exacerbates the already disproportionate impact hospitals have on the environment. Re-introducing the semi-private patient room back into contemporary American hospitals would achieve a reduction in

preliminary building costs and consumption of building materials, smaller areas to condition and possibly reduced electrical and plumbing runs due to the decrease in size of the nursing unit.

The question still remains as to whether a redesigned semi-private patient room might be able to confront some of the current trends facing healthcare today, including the increase in area per patient required for care contributing to a larger issue of environmental sustainability, the increase in the cost of healthcare, and the increase in travel distances across nursing units, which in turn affect the operational cost of the hospital and efficiency of patient care. This thesis argument is of the belief that a redesigned semi-private patient room for contemporary American hospitals might serve as a catalyst in beginning to reverse these broader issues currently facing healthcare today.

[RE]QUALIFY the application

When considered within the context of the contemporary healthcare system, the semi-private patient room may not have universal application today but may have the potential to remain a relevant and viable model for certain patient populations and care scenarios. If so, it merits reconsideration and redesign. Concluding that some patient populations may still be well suited for sharing a patient room during their stay at the hospital, an extensive analysis helped reveal those patient care scenarios that may benefit the most from a semi-private room. Determining characteristics that might aid in qualifying one patient group over another include the patient's age, length of stay, medical condition, mobility, and need for the social support of peers undergoing similar illness-related emotional stress. Patient populations that might be more suited for the re-appropriation of a redesigned semi-private patient room include but are not limited to rehabilitation patients, oncology patients, pediatric patients, and transplant patients. Each of these populations share a greater need for socialization and emotional support. They also typically experience longer lengths of stay, potentially compounding the impact of adequate social support and more engaged nursing care.

Adolescents, usually more uninhibited than adults, might prove to be an appropriate age to really benefit from the socialization and support that might come from sharing a room with

another patient approximately their age and undergoing similar circumstances. A study conducted among adolescent patients, ranging in age from 12 to 21, found that adolescents were divided between preferring a room alone (40% of patients interviewed) and preferring a room with one other person (39%) (Miller et al., 1998). The age and generation of a patient will invariably play a significant role in determining the appropriateness of certain patient care populations.

A unique patient care scenario, affecting millions of Americans every year, that might also benefit from sharing a room is oncology. Cancer and the inpatient care of cancer patients is unique in its symptoms, treatment plans, and side effects, and it is something that only those going through can really understand. Cancer is also something that requires frequent visits to the hospital before and after treatment, and tends to stay with patients for longer durations. The opportunity to build relationships with other patients sharing similar experiences seems that it would prove valuable to all patients at all different stages of cancer, whether they just received the news that they have been diagnosed with stage two colon cancer, or they are going in to the hospital for their second to last chemotherapy treatment, or even if they have been in remission for the past year. Cancer patients, specifically, have the potential to really benefit from the support of other patients going through the same thing. Pease and Finlay

questioned a selection of oncology patients (varying in age and gender) and discovered that 68% of the participating patients favored the company provided by a multi-bedded patient room over the choice to be hospitalized alone. However, the results from the families of the participating patients revealed a higher preference for their loved ones to be cared for in a private patient room setting, indicating the considerable influence the role the family is presently having in patient care.

The social support patients sharing a semi-private room could provide to each other from the perspective of another person undergoing a similar experience cannot be underestimated or dismissed. It is not healthy for any person to be left in isolation and patients are no exception. People benefit from human interaction, contact, and connection, and the bond that could possibly be shared between patients recovering in the same patient room might offer empathy and support that cannot be gained from anyone or anywhere else. And, while the socialization aspect to sharing a room might be dismissed as unimportant to patient healing and recovery, anecdotal as well as empirical evidence exists suggesting otherwise. In fact, Malcolm reports on a recent study conducted in New Zealand among patients, representing both males and females aging 16 years and older, that found "a positive aspect to sharing a room was highlighted by comments that ranged from a sense of support proffered after

discussions with the health professional to companionship in an otherwise lonely environment” (Malcolm, 2005). Patients and staff from the study were quoted specifically stating:

“It is pretty good to have other people in [the hospital] to talk to... you don't have to worry about yourself.” (Malcolm, 2005)

“I have seen the patients start actually supporting the other person quite a lot as well. It wasn't always a negative experience (sharing a patient room).” (Malcolm, 2005)

The social support exchanged between patients sharing a room is not only at an emotional level, but can also exist at a fundamental and practical level; for example, one patient might be able to alert a nurse if he or she recognizes their neighboring patient has fallen and is unable to reach or locate a nurse call. In fact, one new hospital in Germany recently decided not to include any private patient rooms in the inpatient unit design, anecdotally citing patient safety as the primary reason for doing so. Patients participating in the caring for and watching over of other patients has, apparently, become an integral and relied upon role in the German culture as it is not as common to have families staying over in the hospital for long periods of



21. Jack Nicholson and Morgan Freeman offer support and encouragement to one another while sharing a patient room in their recent film together, *The Bucket List*.

time with their loved ones. Stories supporting the Germans decision to accommodate two or more patients in a room due to patient safety concerns also exist in the United States as well. Two female patients suffering from breast cancer were receiving treatment in an older hospital in Maryland, and therefore were sharing a semi-private patient room. It was early evening when one of the women went into cardiac arrest. The other patient in the room was able to respond quickly and call for the nurse's attention, in essence, saving the woman's life that night. In this case, it was in the best interest of the patients to play an active role in caring for one another (C. deVerneil, personal communication, October 12, 2008).

This study was originally inspired by the Hollywood film, *The Bucket List* starring Jack Nicholson and Morgan Freeman. The story revolves around the relationship between the two men, both terminal cancer patients, and takes place primarily in the setting of a traditional American semi-private patient room. At the onset of learning that they will be sharing a room together, both men are seemingly appalled at the situation. Jack Nicholson's character comes from a wealthy background with little value found in family or relationships and great emphasis placed on wealth and material things. Morgan Freeman's character is expectedly the opposite, having little in material wealth in comparison, but finding great strength and support from his family. The two men seemingly have nothing in common other than they are

dying from this horrific disease which eventually takes both of their lives. Over the course of their stay in the hospital, a relationship slowly develops between the two men as they are able to confide in one another, laugh together, and provide unconditional support and care for each other in the darkest season of their lives. The two men really seem to share an understanding and empathy for one another that can only be felt by those actually walking through the same experience. This movie serves as a visual representation of what a redesigned semi-private patient room might offer patients in contemporary American hospitals, highlighting the potential for socialization and support received from patients sharing a room. And, while *The Bucket List* is a movie with a developed plot meant to engage an audience and evoke an emotional response, there is no denying that movies are often inspired from real life. Undeniably so, there is potential for certain patient populations, varying in age and illness, to really benefit from the support and care of another patient, as Jack Nicholson and Morgan Freeman experienced in their recent film together. However, it is essential to move beyond the sentiment inspired by this film and the real life stories it may represent. It is also necessary to address the real issues and concerns that have driven the move to private patient rooms, and explore if and how they may be addressed in a semi-private patient room.

[RE]EVALUATE the concerns

Many issues facing contemporary American healthcare have played a role in driving the transition to exclusively private patient room hospitals. The desire to optimize room occupancy and minimize room reassignments is a critical and valid concern. While all-private patient room hospitals provide the hospital with the opportunity to achieve 100% occupancy, filling every bed, anecdotal evidence suggests that mixed nursing units, containing a combination of both private and semi-private patient rooms achieves approximately 85% occupancy. In addition, the patient-centered care movement as well as consumer preference has contributed to this shift of a more private patient care environment. Market forces direct health systems to attract people with good health insurance to help cover the cost of the uninsured and under-insured. Depending on the ultimate outcomes of the recent federal initiative to increase access to health insurance for more Americans, this trend may ultimately be about to change. And these concerns are only to name a few; a growing body of research and literature, while not yet conclusive, has exposed the following issues below.

Contributing to the disappearance of the semi-private patient room today is a growing list of concerns associated with two patients sharing a single room for care. In recent years, an extensive amount of literature has been written on the comparison between the two models

of care, the semi-private and the private patient room. The most frequently cited concerns with the semi-private patient room and its relevance in contemporary American healthcare include patient privacy, patient control over the environment, and adverse events that occur in hospitals including medical errors and, perhaps receiving the most attention, infection control. These concerns must be completely understood and thoroughly researched so that an appropriate response to these current issues might receive comparable attention and priority in the redesign of the semi-private patient room.

Of primary importance to any individual being admitted into the hospital, especially in the United States, are the issues of privacy and control over the environment. And, as the family continues to play a greater role in patient care, the need to adequately address these two concerns will be crucial in the success and survival of a contemporary semi-private model.

One of the most commonly understood and widely accepted definitions of privacy is defined as “the state or condition of being alone, undisturbed, or free from public attention, as a matter of choice or right” (Oxford English Dictionary). Webster’s Dictionary identifies privacy as “the quality or condition of being apart from company or observation” (Webster’s Dictionary). It must be acknowledged that many people do, in fact, equate privacy with being



22. A traditional semi-private patient room provides only a cubicle curtain for patient privacy.

separated from anyone they do not choose to invite into their personal space. A patient staying in the hospital is often placed in a vulnerable position in which they have little control over their personal situation, as well as their environment. A traditional semi-private patient room inherently adds to this loss of control as patients are not only sharing a room, but in conventional room models, they are sharing personal space along the same headwall, a television, a view outside, a bathroom, and one another's intimate conversations with staff, visitors, and families.

As it currently stands, the semi-private patient room model does not successfully accommodate a patient's or their family's right to privacy and control of their surrounding environment. A patient's right to privacy does not have to be completely sacrificed or compromised in a semi-private patient room. Malcolm claims that privacy "depends on individuals' different understanding of the concept within the values and normative qualities that govern their lives" (Malcolm, 2005), therefore inferring that privacy varies significantly between individuals and across cultures. However, privacy as defined by Newell is recognized instead to be "a voluntary and temporary condition of separation from the public domain" (Newell, 1998). Contrary to the popular understanding of the definition, even the author concedes in the conclusion of her study that "there is a lot more to privacy than being

alone" (Newell, 1998). Therefore, privacy does not have to mean isolation for a patient during their hospital stay. In the context of a semi-private patient room, a greater degree of privacy could be offered in a redesigned room than what is currently experienced in traditional semi-private patient room models. The semi-private room could help to temper the impact of the unsanctioned intrusion by the neighboring roommate, their family and other visitors by offering each patient adequate provision of personal space; first, by rearranging the patient beds so they are not directly adjacent to each other. Direct access to and from each patient's personal space without invasion of the personal space for the other patient is also a strategy that could be reconceived in the semi-private patient room to offer patients a degree of privacy, more control over their environment, and more ownership over their individual, personal space within the room.

The need for privacy experienced by all patients during their stay at the hospital is multifaceted, including a need for both visual privacy as well as auditory privacy. Conventionally, visual privacy has been accommodated for through the use of a thin, cubicle curtain drawn around each patient's bed. The curtain often falls short of protecting all possible visual angles to the patient bed even though it is still the most common applied solution. And, while drawing a cubicle curtain closed in a traditional semi-private patient room model may protect

a patient's visual privacy it fails to attenuate sound, often broadcasting what would otherwise be a private conversation.

The use of new and innovative technologies, such as focused sound, provides a viable and cost effective solution to one aspect of patient control of audio privacy in the traditional semi-private patient room models. Focused sound technology would give hospitals "the ability to focus sound at one individual while nearby people hear nothing" (Schurman, 2009) addressing the conflict in projected sound that may occur with two patients in a single space trying to enjoy separate entertainment programs. Focused sound only addresses the sound projected from a device such as a television or the internet, for instance. However, it fails to provide a solution for the audio privacy needed for intimate conversations that often take place in the patient room. The Health Insurance Portability and Accountability Act (HIPAA) has "further elevated the importance of reasonable safeguards to protect the confidentiality of staff conversations with and about patients" (Ulrich et al., 2004) increasing the necessity of addressing auditory privacy for any redesigned semi-private patient room model to really be a viable option in patient care. Patients sharing a room often answer questions related to sensitive or embarrassing matters in their medical history incompletely, risking misdiagnosis or causing a limited exchange with their doctors wherein they do not receive accurate

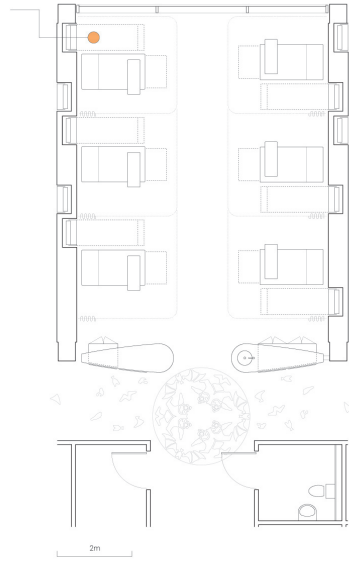


23. Contemporary private patient rooms offer patients control over their environment.

information related to their medical condition or options for treatment. Invariably, a limitation of the semi-private patient room is the response to HIPAA requirements and the ability to keep private conversations private. While moveable panels might provide an increased level of visual privacy, the reality is that these panels would inadequately protect the conversations of other patients and whomever they might be speaking with. This issue remains to be solved and warrants further study, technological resolution and research for the application of a redesigned semi-private patient room to be considered a more broadly adopted room model for patient care in American healthcare today.

Regardless of whether or not one is in the hospital, two or more people sharing a common space will inevitably concede or relinquish some of their environmental preferences and ability to control their environment, such as room temperature or noise level, within the given territory. Through improved family accommodations, equal access to views and natural light, and dedicated HVAC systems above each patient bed a semi-private room can offer a reasonable alternative to the private room in terms of greater privacy and control when compared to conventional multi-bedded rooms. For example, traditional semi-private patient rooms do not usually offer each patient their own window for access to daylight. If one patient is trying to rest or experiences discomfort because of the daylight coming from the window, it

Murphy beds provided for family or friends to stay overnight with each of the patients.



24. A six-bedded ward at Evelina Children's Hospital, highlighting family Murphy beds.

would be in that patient's best interest to pull the curtain or close the blinds over the window. The neighboring patient sharing the space really has no control over this and therefore, concedes their preferences or even what might be beneficial to them in the healing process. A redesigned semi-private patient room could address this by allowing for each patient to have a separate aperture, giving the control of daylighting and views to nature back to the discretion and desire of each patient in the room.

Although not a design consideration in traditional semi-private patient room models, appropriate family accommodations should be provided for regardless the number of patients being cared for in a room. At present, the standard semi-private patient room in the United States generally includes at best a single chair for visitors at each patient's bedside; yet, this is not adequate or appropriate to support the role the family plays in patient care today. With an increased presence and involvement in patient care, families' daytime needs as well as overnight needs should be considered and planned for in the design of the room. Evelina Children's Hospital, a recent addition to St. Thomas in London, has accounted for families who might desire to stay overnight with their child during their stay by thoughtfully including one Murphy bed next to each patient's bedside, even in the larger, six-bedded patient rooms.

Invariably, two individuals sharing a patient room will encounter conflicting needs of their own as well as of those who might be visiting them. It is not uncommon that while one patient might be trying to take a nap, the neighboring patient may have just welcomed a group of excited visitors who want to have a conversation all together. In this situation the current semi-private patient room model fails to provide flexibility within the room to effectively accommodate both circumstances simultaneously. And, disruption to patients' rest and healing will directly affect the rate at which they recover as well as their outcome.

Placing the patient beds on different walls might aid in creating greater distinction between each patient's personal space and the activities that take place in that space, as opposed to what is commonly seen in traditional American semi-private patient rooms where patients beds share the same headwall. Arranging beds in this fashion allows each patient to have a more defined personal space with greater separation and equal access to the window, entry corridor and bathroom without compromising the other person's personal space. This would help minimize disruptions by staff and visitors entering the room and moving around the bed to see and care for each patient.



25. Increased levels of privacy and control have been designed into airline seating.

Control of the environment is believed to influence patient outcomes. Researchers assert that the ability to adjust one's environment positively impacts the healing process, while by contrast "sources of patient stress are perceived lack of control ...noise, and crowding. These sources, in turn, can manifest as negative patient outcomes, such as problems with sleeping and compliance with medication" (Ulrich, 1997). Although commercial air travel is not always a very controlled or comfortable experience, these aircrafts do provide control over each passenger's allocated 2' by 2' environment by offering individual lighting control, air temperature and flow control, as well as television and sound control. With all of the new and innovative technologies available today, the semi-private patient room at a minimum should present its patients with sole control over their artificial lighting, access to daylight and views of nature, thermal comfort, entertainment and audio levels to suit their environmental needs. Currently, the contemporary private patient room offers some level of control over one's environment, allowing patients the ability to adjust lighting, sound and thermal levels according to their desires without having to concern themselves with the needs or preferences of their neighbor – in some cases only if they can get out of bed to adjust all of these controls.

However, it is worth considering whether or not a patient, who upon admission to the hospital inherently relinquishes some degree of control, actually requires complete systems control in order to heal, or if this consideration merely reflects the trend of 'hospital as hotel' common in healthcare design today (Malcolm, 2005). Referencing what is being done in other developed nations around the world, patients are being cared for and recovering in rooms that provide little to no systems control to individual patients sharing a multi-bedded room. This alone calls into question the degree to which it is necessary to provide such provisions and whether or not they are being incorporated into the room based on empirical research that supports positive patient outcomes with this provision or whether this is purely a response to the marketed hospitality trend rampant in American hospitals today.

Adverse events in hospitals, including nosocomial infection, medical errors and patient falls, have been associated with more than one patient sharing a room. Logic seems to support this argument, however it has proven difficult to isolate specific cause and effect in many instances in order to establish a direct correlation between multi-bedded rooms and adverse events (Ben-Abraham et al., 2002; Cepeda et al., 2005; Chaudhury et al., 2005; Joseph, 2006). Other factors, including poor hand hygiene habits, old or ineffective air filters, or even staff stress, often lead to adverse events in the healthcare environment. One study intended

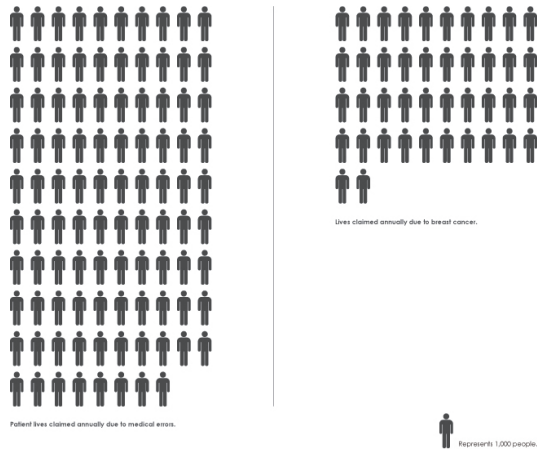
to determine the effect of isolation rooms on the direct spread of nosocomial infections in a pediatric unit found a benefit to enhanced isolation measures on hospital-acquired infection rates, “but they failed to specifically delineate the role of a room separation technique” (Ben-Abraham et al., 2002).

The semi-private patient room alone is not responsible for increased hospital-acquired infection rates during routine inpatient care, although a large body of literature attempts to target the number of beds in a patient room to be a primary culprit. Empirical evidence exclusively linking infection control and the number of beds in a room remains limited and inconclusive. Healthcare facilities across The Netherlands are achieving infection control rates lower than that of the United States' national average, while primarily caring for the majority of its' patients in multi-bedded patient rooms. A recent study estimated that 4.5 hospital-acquired infections effect every 100 patients admitted to the hospital in the United States today (Klevens et al., 2007). In contrast, The Netherlands monitors a similar hospital-acquired infection rate varying per individual hospital from as high as 10% in a few facilities, down to as low as 3% in other facilities (van Benthem et al., 2008). Caution must be used when drawing direct comparisons between the two rates as it is difficult to assume that the rates were derived from identical means. In actuality, other factors, particularly frequency of



26. Hand washing plays an important role in the decrease of nosocomial infections.

hand washing by caregivers prior to engaging in patient care activities, have been proven to more significantly influence the spread of infection within hospitals than patients sharing a room. Van de Glind et al. "concluded that there was a lack of stringent evidence to link hospital design with prevention of infection. They argued that other factors, especially hand washing, had greater impact" (Van de Glind et al., 2007). The careful placement and location of hand washing sinks in any patient room plays an imperative role in the success of their utilization. Evidence contradicts the notion that the relationship between hand washing frequency and the ratio of hand washing sinks in relation to the number of patient beds is causal. "A comparison of an ICU converted from an open unit with few sinks to single rooms with one sink per room found a non-significant tendency for hand washing to increase (from 16 percent to 30 percent) and no decline in infection incidence" (Ulrich, 2004). Ulrich goes on to conclude that "these results are perhaps explainable by the fact that several sinks in the single-bed unit were placed in comparatively inaccessible or inconvenient locations" further supporting the belief that the methodical placement of staff hand washing sinks is of utmost importance. As in a private patient room, hand washing sink(s) in semi-private patient rooms must be accessible, convenient, and serve as a reminder to wash hands between caring for each patient. At the Martini Hospital in Groningen, The Netherlands, the location of hand washing sinks in the patient rooms as well as on the unit are highlighted with neon colors,



27. Patient lives claimed annually (in thousands) due to medical errors in relation to those claimed due to breast cancer.

against otherwise white walls, serving as a loud reminder to staff to remember to wash their hands.

Currently a leading cause of death and injury in the United States, medical errors are a critical issue that healthcare facilities are actively seeking to minimize. Private patient rooms are believed to reduce the occurrence of medical errors as they eliminate potential confusion between patients with respect to their charts, medications and dietary restrictions. As an example, it would be very difficult for a nurse caring for as many as six patients at a time to be able to keep separate two children diagnosed with the same illness, who are about the same age and sharing the same room. To administer the wrong dosage or, even worse, the wrong medication to a child in this scenario would likely be fatal. It is understandable how a scenario similar to this might cause confusion for nurses, who are prone to experience significant levels of stress, fatigue and even burnout in an average workday. Influencing the occurrence and frequency of medical errors in hospitals today are other factors such as staff stress and exhaustion that can often be associated with long shifts, noise levels and poor lighting on the nursing unit, as well as ergonomics, furniture and equipment (Chaudhury et al., 2009). These other factors contribute to the incidence of medical errors adding validity to

the acknowledgement that “further studies and demonstration projects are needed to ascertain the safety advantages” of the private patient room model (Ulrich et al., 2004).

Irrespective of the room model, environmental distraction, the potential confusion between patients and the tendency to cause medical errors is currently being addressed in many facilities by implementing strategies such as electronic medical records as well as bar coding for patient identification and linking with appropriate medications and supplies. Experts estimate that approximately 98,000 people die in any given year from medical errors, exceeding the number attributable to motor vehicle accidents (43,458), breast cancer (42,297) or AIDS (16,516) (Kohn et al., 2000). The urgency of this issue is apparent and the future design of patient rooms, private or semi-private, together with the implementation of new advances in technology and operational protocols, should contribute to reducing medical errors from hospitals.

Adding to the astonishing number of adverse events that take place in the healthcare setting, patient falls are often associated with the dosage and type of medication a patient may be taking, but can also be a result of patients moving between their bed and the bathroom, either independently or assisted (Ulrich et al., 2008). Frequently in traditional semi-private patient



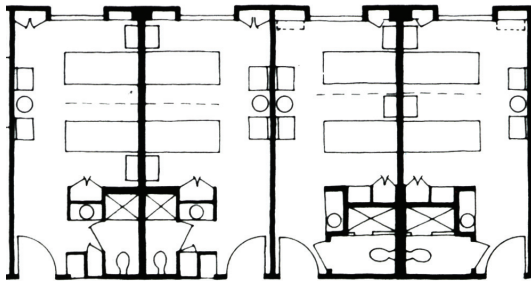
28. An example of a contemporary private patient room.

room models the bathroom is closer and more accessible to one patient than the other. A redesigned semi-private room should offer both patients equality in accessibility and minimal travel distances over open space from the patient bed to the bathroom. Perhaps an often overlooked advantage of a semi-private patient room is the opportunity for increased patient observation, with patients partaking in the “watching over” of one another. If one patient were to fall on the way to the bathroom and be unable to call a nurse for help, the neighboring patient would be in the room to witness what happened and also be able to call a nurse immediately. The University Medical Center of Hamburg-Eppendorf, a new construction hospital in Hamburg, Germany, recently rejected the use of private patient rooms in favor of semi-private and multi-bedded room models citing patient safety as the hospital’s reason for doing so (Nickl and Partner, 2009).

The argument surrounding the all-private patient room hospital has been propagated by the aforementioned growing concerns in contemporary American healthcare: patient privacy, patient control over their environment and adverse events including infection control, medical errors, and patient falls. While these concerns have been strongly considered and studied in the literature, little attention has been rendered as to how these concerns might be addressed and confronted in semi-private patient room design. Instead the solution the United States



29. An example of a traditional, American semi-private patient room.



30. A traditional semi-private patient room plan with an inboard toilet.

has turned to has been to abandon the multi-bedded room model all together. Whether or not this is ultimately the best decision for contemporary patient care in America remains in question. A redesigned semi-private patient room could seek to incorporate design strategies that address these concerns.

Greater patient privacy could be accommodated for by providing room-dividing panels that allow each patient an increased level of privacy from what they might experience in a traditional semi-private patient room. With unique artificial lighting settings and individual thermal conditioning systems for each patient, greater control of the environment can be achieved for both patients sharing the same space, but experiencing different needs. Advanced technologies, such as patient bar coding, have already been implemented into patient care in effort to decrease the occurrence of medical errors. However, visual cues that aid in identifying patients (and that are already in place in many private patient rooms) could be designed into a reconceived semi-private patient room, making it more viable for patient care today. And, while infection control remains one of the greatest concerns with the semi-private patient room model, it is suggested again and again in the literature that hand washing and the strategic location of hand washing sinks has the greatest effect on the reduction of hospital-acquired infections, implying that with thoughtful design and the

implementation of rigorous hygiene programs among staff, comparable infection control rates could in theory be achieved through a redesigned semi-private patient room.

The fundamental design decision of bed placement inherently contributes to many of the disadvantages found in the semi-private patient room most commonly seen in American hospitals today. Unequal access to daylight and views outside to nature is one disadvantage resulting from the placement of beds side by side, sharing the same headwall. In this design scenario, one patient will intrinsically be closer to the exterior window wall and one patient closer to the corridor wall. Given the window placement, outboard bathroom location, window size and sight lines in most rooms, the patient adjacent to the corridor wall (and furthest from the window) will inevitably experience little or no access to daylight or views to nature, especially when the cubicle curtain is drawn around their neighboring patient, which stands between them and the window portal beyond. And, if unequal access to daylight and views is experienced on one side of the room, then it is inevitable that there is also limited and unequal access and visibility to and from the outboard patient for staff from the corridor/entry side of the room. In a similar situation, the patient bed closer to the window wall might be cut off completely from staff observation if the cubicle curtain is pulled closed around the patient bed located closest to the corridor wall. Another critique of the traditional semi-private patient

room model is the absence of adequate family accommodations. In healthcare today, especially in American culture, the family has assumed an active role in patient care in hospitals. Most new hospitals provide all patient rooms with a defined family zone and overnight accommodations for family members that would like to stay with their loved one during the entirety of their stay. This must be considered and accounted for in a redesign of any contemporary semi-private patient room in order for it to be a viable model for patient care today. Locating the patient beds on the same head wall presents inherent challenges to being able to accommodate both patients' families comfortably in a single room. Intrinsicly, there is less space around each patient bed when they are arranged in such a way. The inboard bed especially suffers from this arrangement since the patient closest to the window often has a little more personal space and room to accommodate visitors and family. This represents yet another issue resulting from the traditional semi-private patient room and the layout of the beds parallel to each other, along the same headwall.

The personal space of each patient in a conventional semi-private patient room is often violated even further in regards to the territoriality of each patient. With the current arrangement, there is often an overlap in territoriality in which each patient or their family is forced to at some point during their stay to cross into or move through the personal space of

their neighboring patient to reach a shared room feature, or just to reach the patient on the other side of the room. For example, the outboard patient invariably has the window, but might also have the toilet room in their personal space. The inboard patient, on the other hand, might have the thermostat, the staff hand washing sink, and possibly the room light switches in their personal space. In the given scenario, each patient's personal space must be violated at some point in order for others to access the features not in their respective personal space. People entering the room to visit the patient in the outboard bed must forcibly pass through the personal space of the inboard patient. This is an inherent reality with the traditional semi-private patient room represented in American hospitals and must be addressed in the redesign.

The conventional semi-private patient room generally does not provide each patient with unique control over their individual environmental conditions such as sound, temperature and artificial room lighting beyond their personal reading light. To feel out of control of one's personal environment will lead to stress and discomfort experienced by the patients, both of which have shown to affect patient length of stay (Ulrich et al., 2008). It is not practical to assume that patients sharing a room will desire to sleep at the same time, watch the same program on the television, or that they will experience the same level of comfort at the same

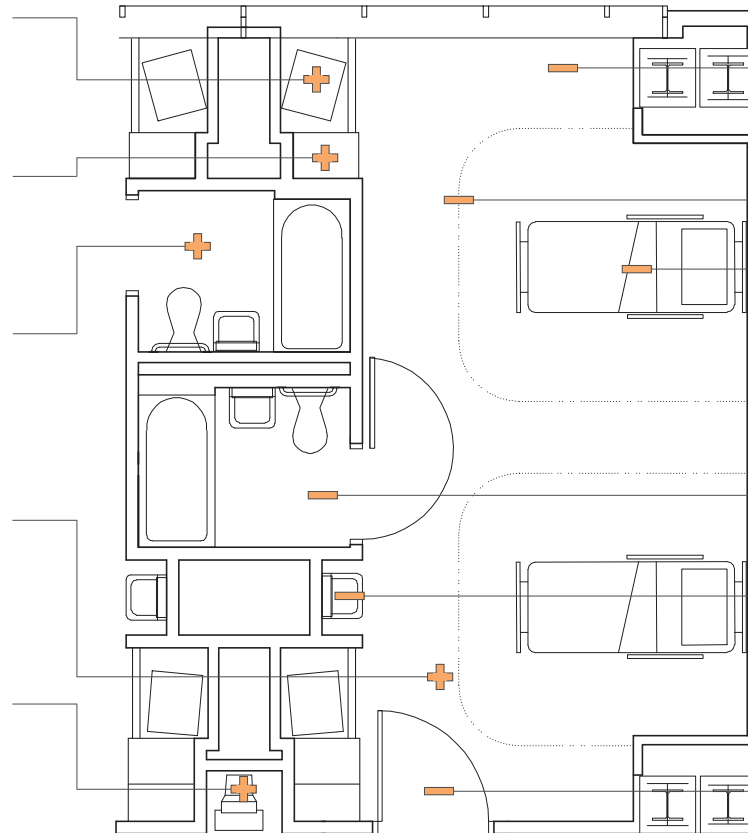
A television for each patient offers at least a minimal amount of comfort and control for patients.

Storage space, available for each patient and their family, is conveniently located close to each bed.

Placement of bathroom between the two patients allows for equal travel distance from each patient bed to the toilet.

Proximity of nurse stations to more patients provides staff the with greater operational efficiencies, as well as shorter travel distances.

Nurse stations located between two multi-bed patient rooms allows for four patient to be supervised at once.



Only the patient located at the end of each room have direct access to natural light and direct views to nature.

No provision for auditory privacy, and a curtain is the only visual barrier.

Bed arrangement does not allow for maximum control over each patient's individual environment and needs.

Only one toilet for two patients increases the chance of cross-contamination and infection.

Only one hand-washing sink for two patient beds located at the end of the room. Staff is forced to travel back to the end of the room before seeing the next patient.

Location of patient beds in relation to the entrance of the room forces visitors to pass by the first patient on their way to visit the patient by the window, limiting the privacy and sense of personal space the patient close to the corridor feels.

Figure 31. An analysis of a traditional semi-private patient room.

room temperature. In the United States specifically, control over one's personal environment has become an expectation and a standard that patients seek to retain going to the hospital. Each of these disadvantages commonly recognized in the traditional semi-private patient room design must be considered and accommodated in the re-conception of the room.

[RE]CONCEIVE the room

If a redesigned semi-private patient room is ever going to find a place in American hospitals today, it must account for greater privacy, comfort, and control within the semi-private room than what is currently achieved in the traditional semi-private room model. Simple design strategies such as separate toilet rooms, improved visualization and access to nature, physical subdivision of a single space, zoned lighting and heating, controlled ventilation and air conditioning, and dedicated staff work and family spaces could, if implemented, address the critical issues currently celebrated in the private patient room. To better inform the redesign of a semi-private patient room that would not only be relevant but would also be beneficial in contemporary American healthcare facilities, a set of design guidelines has been drafted with the intention that they address these common goals: to improve operational efficiency on the patient care unit as well as in the patient room, to improve the safety of the patient during their stay and their health outcomes, to reduce the increasing carbon footprint healthcare is currently imposing on the environment, to plan for and accommodate the changing needs of patient care over time, and ultimately, to improve the entire healthcare experience for the patients, for their family, and for the staff caring for them. These guidelines include, but are not limited to the following recommendations:



32. Reconceived room less than 320 S.F. but more than the traditional semi-private room.

Room Size: Wherever semi-private patient rooms can appropriately serve specific patient populations and care needs, accommodate two patients in one room occupying less than 330 net square feet of space per patient, while improving upon 180 net square feet of space per patient in the traditional semi-private room model.

The average private patient room, including toilet room, occupies approximately 320 net square feet of space on a typical adult inpatient unit (Latimer et al., 2008). One of the primary focuses of this thesis design project will be to design a room that accomplishes less net square feet per patient, reducing the overall departmental square footage of the patient care unit. And, reducing the size of each inpatient unit should then begin to positively impact the overall construction costs, operational costs and carbon footprint of the hospital. While some of these measures might be difficult to quantify, a reduction in overall departmental gross square footage as well as a decrease in the net square footage per patient bed should be attained. At a minimum, the redesigned semi-private patient room should seek to impact the aforementioned concerns of economic and environmental sustainability by reducing the net square footage currently required to care for a patient by 50 to 75 net square feet per patient room. Simply reducing the room size, however will not be enough to accomplish all the goals set before the redesign of the semi-private patient room. The width and depth dimensions of

the room will also be important factors in decreasing the travel distances experienced by nurses, as well as reducing the amount of exterior wall material. Decreasing the width of each patient room inherently contributes to the reduction in corridor length, reducing overall travel distances for care providers and making care support spaces more accessible and visible than they were before.

Currently, the typical private patient room in new construction hospitals today accommodates two patients in two rooms in a 30' wide column bay. A semi-private patient room design should improve upon this number in order to affect travel distances and the overall departmental gross square footage of the patient care unit. The redesigned room should aim to achieve a tighter width. A reasonable range to aim to design within might be between a 24' and a 28' structural bay width, while maintaining the standard depth of 30'. A 24' structural bay width would achieve an average corridor length of 12' per patient as compared to today's average of 15' of corridor per patient bed. In addition to achieving shorter travel distances per patient, the 24' structural bay also provides a unique opportunity for the adaptive reuse of hospitals built in the past utilizing a 24' structural grid. This has recently been abandoned in favor of the 30' bay structural grid, however redesigning the semi-private patient room to fit within a 24' bay size provides an option for hospitals looking to renovate.

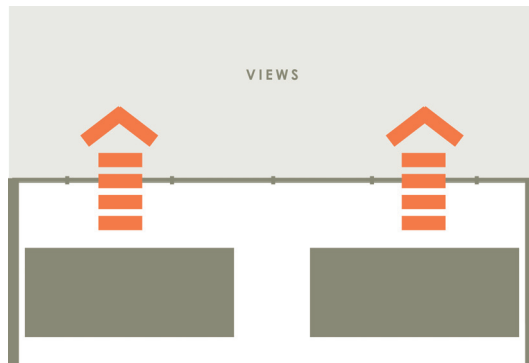


33. A semi-private patient room from Martini Hospital.

The Martini Hospital, completed in January 2008 and located in Groningen, The Netherlands, utilizes a traditional semi-private patient room model in order to maximize the number of patients on each unit, while providing the staff with minimal travel distances on the inpatient unit. By using the more conventional room model, the hospital manages to achieve 180 net square feet of space per patient in both the semi-private patient rooms and multi-bedded patient rooms housing four patients, in a structural grid size of 24' in width by 30' in depth.

This case study, utilizing a new hospital in The Netherlands, seeks to provide a point of reference as to what other hospitals in countries around the world are defining as the standard for the amount of space required to adequately care for patients, yet this room still arranges beds two deep – a sub-optimal configuration – on the same headwall.

Again, the goal will be to achieve a net square footage that improves upon the current average of 330 N.S.F. per patient seen in typical, new construction, all-private patient room American hospitals while by necessity offering patients a greater amount of space than what was previously accommodated for in the traditional model of 180 N.S.F., designing for and providing features favored in the private room model.



34. Diagram of views and natural light.

Views and Natural Light: Each patient in a semi-private room should have equal and direct access to a large window providing views outdoors and to natural light. This precludes the traditional arrangement in semi-private rooms where two beds are located on one wall – one inboard and one outboard.

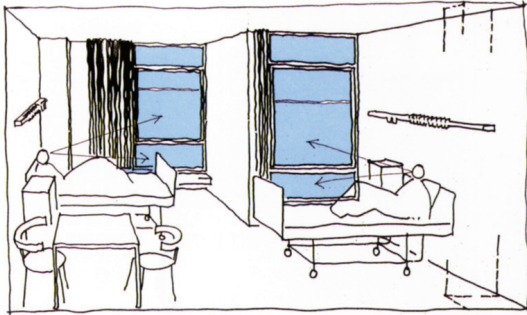
Private patient rooms in the United States today often boast generous windows allowing ample views to nature when available, making this room feature a priority during design. And, as the traditional semi-private patient room is designed today it does not offer a comparable view to both patients. Intrinsicly, the patient bed closest to the exterior window wall receives direct access to daylight and views to nature, while the patient bed located closer to the interior corridor wall has an indirect view out beyond the patient bed in between. If the outboard patient, closest to the window, has the cubicle curtain pulled closed around them for privacy, it might be then impossible for the neighboring inboard patient to have any access at all to the window. “Laboratory and clinical studies have shown that viewing nature produces stress recovery quickly evident in physiological changes, for instance, in blood pressure and heart activity” (Ulrich et al., 2004). Furthermore, “strong studies using experimental designs have produced additional convincing evidence that viewing nature reduces patient pain as well as stress. These investigations also support the interpretation that nature serves as a



35. Patient room with views to nature at Legacy Salmon Creek.

positive distraction that reduces stress and diverts patients from focusing on their pain or distress" (Ulrich et al., 2004). The reduction in patient pain and stress often results in decreased lengths of stay for patients who receive views onto nature during their stay at the hospital.

Therefore, position patient beds so that each patient is afforded an equal opportunity to view the outdoors without another patient bed or toilet room to look beyond. At Legacy Salmon Creek Hospital in Vancouver, Washington, the patient care units were carefully organized so that the patient rooms received optimum amounts of daylighting and views to nature from an adjoining nature preserve. Priority was given to the arrangement of the patient care units and the patient rooms themselves to ensure that each room benefit from the nature surrounding the hospital. Generously sized windows were given to each patient offering beautiful views outdoors as well as flooding the patient room with natural daylight. Large windows and views out should be provided in the redesigned semi-private patient room so that each patient might have equal access to the daylight in addition to contributing to the feeling of airiness and openness in the patient room.

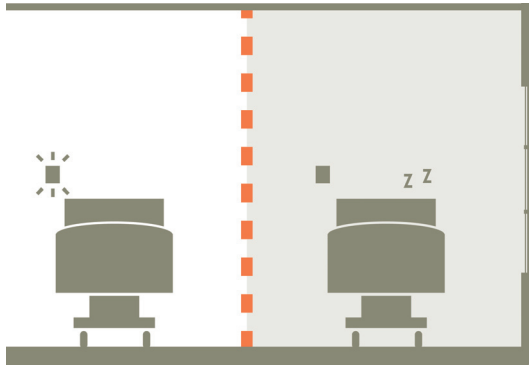


36. Saw tooth exterior wall also provides patients with equal access to daylight.

An appropriate bed arrangement will be critical in the redesigned semi-private patient room to make sure that each patient is given direct, equal access to the exterior window wall so that they might both be exposed to the advantages afforded to patients that benefit from natural daylight and views on to nature during their hospital stay. This design goal inherently implies only one solution, mirroring the patient beds, unless the exterior wall is adjusted to form a saw tooth pattern, for example, giving each offset bed equal access to an individual aperture out to nature.

Personal Space: To offer patients staying in a redesigned semi-private patient room a greater level of personal space, privacy and control over their individual environment, patient beds, at a minimum, should be positioned so that there is physically enough space around each of the beds to provide adequate care and that the space is clearly demarcated and used exclusively for the intended patient.

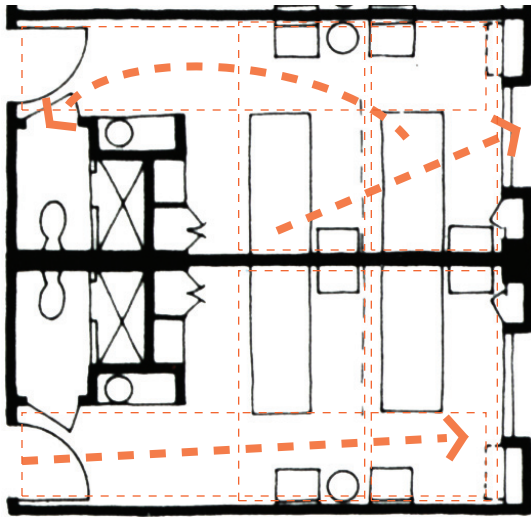
Today, patients and their families anticipate when coming to the hospital that they will have options to control interactions with other patients, families, and visitors. The prospect-refuge theory of human involvement with the built environment is relevant and applicable when describing the human desire for personal space. Verderber writes that:



37. Personal space diagram.

“It is important to distinguish unwanted interactions with others from controllable or otherwise desirable (prospect) interactions. The latter types are those where the patient may actively seek to engage in a conversation, or perhaps watch a television program with others, by choice. Similarly in semi-private rooms it is important to provide the option to greatly reduce contact with others (refuge). This can be achieved through the judicious design of pull curtains, well-positioned and easily deployed wall partitions, proper orientation of the bed, wall recesses and nooks for personal artifacts to be both stored and retrieved... and proper orientation of the door and windows to the room. In addition, the patient room should be zoned for social space, flexible, and adaptable to diverse activities, including sleeping and quiet rest periods.” (Verderber, 2010)

As emphasized above, a degree of personal space is required at some level for every individual in almost every circumstance, and a patient receiving care in the hospital is no exception. Bell et al. assumes that “we maintain personal space to avoid a variety of stressors associated with too close a proximity” (Bell et al., 1978). And, minimizing the amount of stress a patient experiences during their stay at the hospital is always a priority when designing patient care environments. Personal space can be achieved not only through



38. Personal space conflicts within the traditional semi-private patient room model.

the distance that separates two individuals but also through the provision of control over one's environment.

Therefore, distinguish each patient's space within the same room by arranging patient beds so that a greater degree of personal space is accommodated, using material changes or partition walls (for example) and providing unique control over environmental factors, such as lighting. Traditionally in the semi-private patient room, the boundaries of personal space for one patient blurs into semi-public movement space used by both patients, staff and visitors to move around the room and access various features. With patient beds along the same headwall, theoretically one patient bed might be closer to the toilet room and the window while the other patient might have closer access to artificial lighting and room temperature control. These are shared features that in order for patients and visitors to access, they might likely have to leave their dedicated space and enter into the neighboring patient's space to be able to access, adjust or control. Each patient's personal space should be organized and located in a way that does not require people who are moving in and out of the semi-private patient room to pass through the neighboring patient's personal space. The conventional semi-private room model does not provide for this separation and the inboard patient is



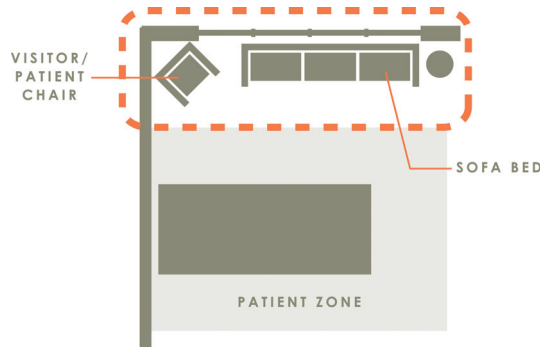
39. Patient room from Kreis Krankenhaus with sliding panels.

invariably going to experience people passing through their personal space, whether or not they were invited and whether or not they are there to see them or their neighboring patient.

In the German hospital, Kreis Krankenhaus Mechernich, personal space was considered for patients and their families through the inclusion of movable partition walls in all of the inpatient rooms. The walls afford the room with the ability to section off parts of the room for one activity while an entirely separate activity takes place in another part of the room. The walls offer the patient room maximum flexibility so that the room might adapt with the changing needs of the patient and their family over the length of their stay in the hospital.

Family Niches: Every patient in a semi-private room should be provided with space near the bed, in the patient's personal space, that adequately accommodates the needs of family members and other personal visitors in a way that does not compromise the personal space of the neighboring patient.

In American hospitals today, patient rooms not only provide for a dedicated staff zone and patient zone, but private patient rooms also accommodate a space intended for the use of the family while their loved one is in the hospital. Rather than locating a room or a suite somewhere else on the patient care unit for families who desire to stay the night, the patient



40. Family niche diagram.

room remains the preferred location for the provision of visitation and overnight accommodation of family members. It is common to see chairs that transform into beds, couches that also transform for sleeping, a table and chairs for eating in their loved one's room, storage for the family's belongings, and even a separate television from that of the patient's designed into the patient room for families and visitors who might like to stay nearby their loved ones. In the planning and design of new American hospitals today, priority is placed on offering patient families comfortable accommodations so that they might feel welcome to remain as long as their loved one is in the hospital.

The patient's family has evolved in their role within the American healthcare setting from merely being visitors or spectators in the delivery of care to active participants in caring for the patient. This change has, for the most part, been well received among hospitals and hospital staff, welcoming the extra set of eyes for observation and the extra set of hands for taking care of the patient's needs. And, with the family spending increasing amounts of time with the patient in the patient room, it is important to consider and design for their needs, as well. In addition to the evolving role of the family in patient care, families often are required to travel long distances from their home to the hospital so that their loved one might receive the best care available for their particular illness. "In the case of specialty hospitals, such as

regional trauma centers, the family may need to be as near as possible for many nights because a family member may require a lengthy period of hospitalization” (Verderber, 2010). By offering each family overnight accommodations sends a message to them that they are invited to stay as long as their child is in the hospital and participate in their care. And with a bed to sleep on at night next to the patient bed, it is certain that more parents will inevitably be staying in the hospital with their child. In the conventional semi-private patient room in America, even a design strategy such as the Murphy bed is not accounted for. Traditionally, a visitor’s chair next to each patient bed is the most one might find for family accommodations in a shared, semi-private patient room. Part of the problem, inevitably, is in locating both patient beds along the same wall, leaving little room to offer a dedicated family zone for each patient in the room. The redesigned semi-private patient room should consider this design decision and take into account for the important necessity of family niches for each patient.

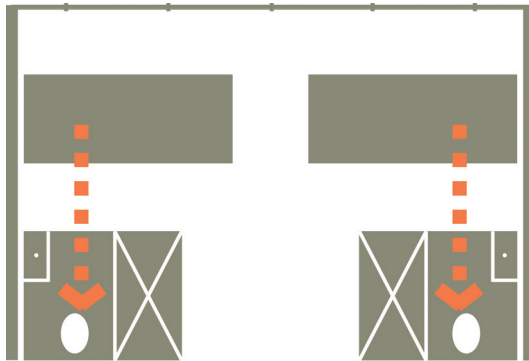
Therefore, dedicate a zone within the room for each patient’s family, adjacent to the respective patient, for activities such as eating, sleeping and visiting. At an absolute minimum a semi-private patient room should provide separate seating for the visitors of each patient to use for socializing, reading, or even eating purposes. For family members who might like to stay the night with their loved one, sleeping accommodations of some kind should also be



41. Family niches at Evelina Children's Hospital.

included in a redesigned semi-private patient room. And, if the family is going to be staying overnight, a wardrobe belonging to each patient and being located within each patient's personal space could also be an amenity for the families to be able to store their belongings in while they are staying in the hospital, as well.

Evelina Children's Hospital, a new dedicated pediatric addition to St. Thomas' Hospital in London, provides an example of how family can be accommodated for in patient rooms with up to six patients. Even in these six-bedded rooms where space is limited, a single Murphy bed has been made available directly next to each child's patient bed so that family might be welcomed to stay overnight and contribute in the care of their child. What is remarkable about this particular case study is the fact that with six patients sharing a single space, families were still considered and provided for in a way that offers them the ability to stay overnight with their child. Using Evelina Children's Hospital as a precedent, the assumption is that with only two patients sharing a room at least what is provided for at Evelina could also be included at a minimum in a redesigned semi-private patient room.



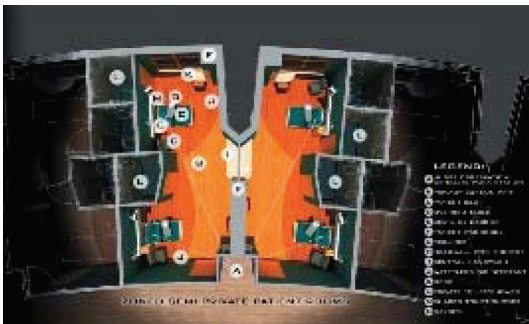
42. Sanitation separation diagram.

Sanitation Separation: A redesigned semi-private patient room should include a separate toilet room, including an individual toilet, hand washing sink, and shower for each patient in the room.

It is very rare to see semi-private patient rooms that do not share a single toilet room. Almost all semi-private room models, in the United States and in other countries, include only one toilet room per patient room, regardless of if that room is accommodating one, two, or four patients. This is certainly a concern and a disadvantage presented by the conventional semi-private patient room. Offering each patient their own, individual toilet room, separate from their neighboring patient might begin to help alleviate some of the concerns. Infection control is a primary concern of the current semi-private patient room, and very sick patients sharing the same toilet and using the same hand washing sink will not positively affect this concern. For that reason, due to increased risk of infection, any patients sharing a patient room should not also share the same toilet room under any circumstances. It is not practical to assume that after a patient uses the toilet room once that the staff would then thoroughly clean and sanitize the toilet room before the neighboring patient uses the toilet room; therefore the risk of cross contamination is very high in this space.



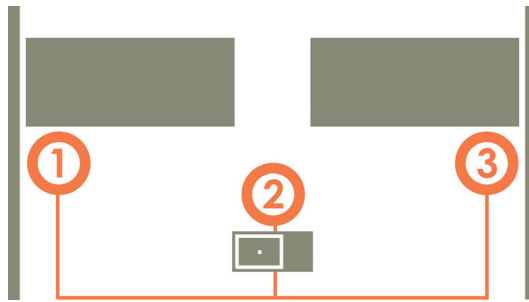
43. “Zoned” semi-private patient room interior view.



44. “Zoned” semi-private patient room plan.

Provide each patient with their own toilet room so as to prevent cross contamination between two ill patients. Therefore, allocate enough space, approximately 40 to 60 square feet per patient, in the redesign of the semi-private patient room so that two toilet rooms, one for each patient, might be included. Locate beds in such a way within the room so that there is opportunity for each bed to have close proximity and equal access to their individual toilet room. The placement of the toilet rooms within the patient room and in relation to the patient beds should minimize travel distance across open space. Also of importance in the location of the toilet room is to situate them in the most private part of the privacy gradient that exists within the semi-private patient room. A privacy variance transitioning from being more public, to semi-public/semi-private, and then to private, reveals that the most appropriate placement of the toilet rooms is the most private part of the room. Provide each toilet room with a separate toilet, sink and shower.

The majority of semi-private patient rooms at present feature a single toilet room for patients to share, both in the United States’ semi-private room model as well as internationally. Marshall Craft Associates, Inc., an architecture firm specializing in the planning and design of hospitals, has developed the only recent attempt at redesigning the semi-private patient room (Burnette, 2006). The “zoned semi-private patient room” is intended for the contemporary



45. Sink placement diagram.

American healthcare setting and offers each patient their own, individual toilet room (Burnette, 2006). The patient beds were placed along the same wall, as is common in semi-private room design, but utilized the space in between the patient beds for the placement of the toilet rooms. Locating the toilet rooms here provided both patients with direct access to each of their individual toilet rooms, without having to traverse across the room or pass another patient, as well as offered a solid visual and sound barrier between the patient beds for a greater degree of privacy and personal space.

Sink Placement: A redesigned semi-private patient room should include at least one hand washing sink per patient room; and, the sink should be located strategically and conveniently at the entry of each semi-private patient room, in clear sight of and along the primary path of travel from the room entry to each patient and between each patient bed for both staff and visitors.

The location of the hand washing sink within a patient room will inevitably impact how often that sink is used. If it is inconvenient for a nurse or a visitor to get to the sink before or after caring for a patient, then it is likely they will either not remember to or simply just not take the time it might require to wash their hands. One of the most strategic locations in which many



46. Hand washing station at Martini Hospital.

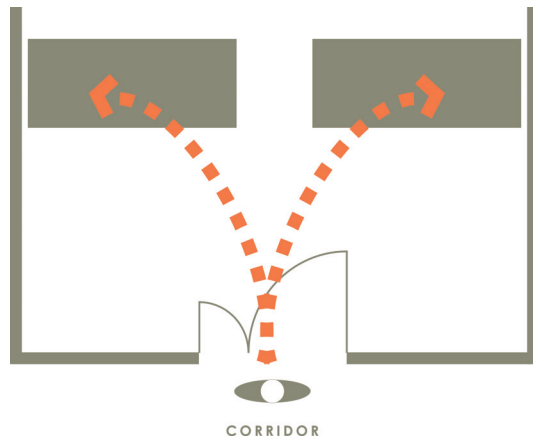
hospitals have employed is placing the hand washing sink in the entry throat or vestibule of the patient room, serving to remind people entering or exiting the room to wash their hands before engaging with others. This is often the location of an alcohol wash or hand sanitizing station as well.

Hand washing has been cited on multiple occasions as being the most effective way to reduce the spread of nosocomial infection. Architecture influences the frequency of hand washing by the strategic or the inconvenient placement of hand washing sinks. "A comparison of an ICU converted from an open unit with few sinks to single-bed rooms with one sink per room found a non-significant tendency for hand washing to increase (from 16% to 30%), but no decline in infection incidence (Preston et al., 1981). These results are perhaps explainable by the fact that several sinks in the single-bed unit were placed in comparatively inaccessible or inconvenient locations, such as behind doors or away from staff work paths" (Joseph, 2006).

Martini Hospital, a 580-bed hospital located in Groningen, the Netherlands, made a conscious effort in the renovation of their hospital facility to highlight hand washing stations, conveniently placed on the nursing unit as well as at the entrance of every patient room.

Colors such as neon green, neon blue and neon pink were utilized to draw attention to these hand washing stations and serve as visual reminders for staff and visitors to remember to wash their hands upon entering and leaving a patient room or patient care unit.

Therefore, locate a hand washing sink between the room entrance and the patient bed so that staff and visitors are forced to pass by the sink to reach the patient. This will be the most convenient location for both staff and visitors upon entering the patient room. In the context of a semi-private patient room, a sink placed directly between the beds will serve as a reminder to staff to wash their hands before caring for the next patient. In addition to the placement of the sink within the room, the physical act of hand washing and other activities that might take place here should be considered in the design of the sanitation station. For instance, a wall-mounted sink would not be sufficient for this nurse work area; instead, include some counter space around the sink for staff and visitors to be able to place various objects down while they wash their hands or the objects themselves off in the sink. Furthermore, the staff will inevitably have to turn their backs toward the sink and counter space to wash their hands. Due to this reality, providing a mirror on the wall in which the staff or visitor washing their hands might be facing allows visibility to the patient to continue, even while their backs might



47. Corridor visibility diagram.

be turned away. Also, consider using some non-institutional design feature to draw attention to the hand washing station, as the Martini Hospital did with the use of bright, neon colors.

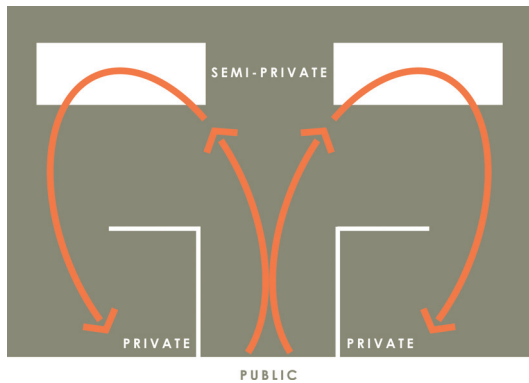
Corridor Visibility: Staff should be able to view both patients equally well from the room entry or corridor outside the patient room for reasons of operational efficiency and patient safety. Therefore, position patient beds so that one patient does not block the view of the other patient and so that staff can see the face of each patient from the entry to the room.

The ability for staff to be able to view the face of each patient, verifying that they are okay, from the corridor inherently contributes to the overall efficiency of nursing care since caregivers are able to “check on” their patient without actually entering into the room. If a patient is not visible from the corridor then a nurse must enter the room to verify that the patient is okay, which takes time and energy, especially when this action is repeated many times across the nursing unit during a shift. Requiring a nurse to go in and out of a patient room just to quickly check on them inherently implies that the nurse will actually check on the patient less often than if the patient were visible from the corridor and could be viewed as the nurse passed by the room on his or her way to do something else.



48. Visibility into patient rooms from nurse perch.

Therefore, provide direct lines of sight from the corridor to the head of each patient in their bed either through the doorway or through a corridor window or sidelight. If visibility to each patient's head is reliant upon views through the entrance, then maximize the width of the viewing angle so that staff might have optimal visibility to the patient's head as they move down the hall, therefore seeing the patient for a longer instant. If corridor windows are utilized one must consider the height of the window sill, as well as patient and family control over blinds that might keep staff from being able to view into the room. Offering patients and their visitors control over window coverings provides the patient with more control over their environment, however this presents an inherent disadvantage to relying upon windows for viewing patients from the corridor as often times the patient or their family has closed the blinds, defeating the purpose of the window all together. At the Children's Health Centre at Surrey Memorial Hospital in British Columbia, decentralized nurse work perches located between patient rooms feature borrowed lights into both patient rooms. The window into the room allows for nurses to be working or merely passing by the patient rooms and simultaneously be able to observe the condition of their patients. The disadvantage in relying upon attaining views to the patient's head from the corridor through the patient room door is that if the door is closed for privacy, staff is unable to view the patient without opening the door and entering the room. The hospital at Surrey avoided this by also including transparent



49. Privacy variance diagram.

sliding doors into the patient rooms further increasing the ability to view the patients from the corridor beyond.

Privacy Variance: Organize each semi-private patient room so that there are clear privacy gradients for each patient transitioning into and through the room. These gradients begin at the most public shared space in the room, such as the entry areas, and move to each patient's semi-private personal space around each bed and family zone, finally ending at each patient's most private and fully enclosed space, a personal toilet room. Each patient's personal space should have equal access to the room entry and a common staff work area.

Within any shared space, individuals will require and desire multiple levels of privacy depending on the activity they are partaking in. A quiet conversation meant for two people requires a greater degree of privacy than ordering a meal from nutritional services. Entering a traditional semi-private patient room, where beds are aligned side by side along the same headwall as a visitor can be uncomfortable as it forces one to pass by one patient entirely to get to another. As a visitor, entering into another patient's circumstance before being able to reach your loved one can be uncomfortable for both visitors and the other patient. The traditional semi-private patient room blurs the boundaries between the natural progression of



50. Entry vestibule at Miller Children's Hospital.

public to semi-private to private, leaving it difficult to wholly achieve any level of privacy other than semi-private.

Therefore, provide opportunities for the patients and their families to experience varying degrees of privacy for all activities that might take place in the patient room. One way in which this might be accomplished is by first orienting the patient beds so that the entry is between the beds, giving equal access to each patient from the entrance of the room. The arrangement of patient beds may vary and still satisfy the charge to provide equal access to both patient beds from the entry of the room. Beds could either be mirrored across the room one from the other, or they might be perpendicular in their relationship to each other. In either scenario, place the entry equidistant from both patient beds, providing an identical experience for both families and visitors who might be visiting their loved one in a semi-private room. Miller Children's Hospital, in Long Beach, California, solved this design problem in their semi-private patient rooms by providing an entry vestibule to each room. The patient beds are positioned in a mirrored arrangement, but the entry vestibule offers a buffer zone between the bustle of patient care unit corridor and the patient room beyond. The vestibule allows families entering the semi-private room to see both patient heads in a moment's glance and turn either left or right to be at the bed of their child. Organize the space in the redesigned semi-

private patient room so that the transitions in the room naturally unfold from the more public spaces and moments that take place within them, to the semi-private zone around the patient beds for interactions between patient and visitor and between patient and caregiver, and finally to the most private space within the room accommodating the movement to and from the toilet room, as well as the activities that take place in the toilet room.

Conclusion: The design guidelines were meant to provide a foundation for the redesign of the semi-private patient room project. A broad approach was taken in crafting each design guideline. They were intended to provide guidance during the design process, not meant to provide specific solutions for the room. The design guidelines also served as a way to evaluate the success of the redesigned room.

[RE]DESIGN project

Site and Context

Before a site could be selected for this thesis exploration, and more specifically for the evaluation of the redesigned semi-private patient room, an appropriate patient care scenario needed to be identified for the application of a semi-private patient room. Some of the patient care scenarios that might be more suited for the re-appropriation of a redesigned semi-private patient room include but are not limited to rehabilitation patients, oncology patients, pediatric patients, and certain transplant patients. Characteristics used to qualify the various patient populations as more or less appropriate for sharing a patient room included the patient's age, length of stay, medical condition, mobility, and need for the social support of peers undergoing similar illness-related emotional stress. Transplant patients not needing isolation emerged as one of the more suited possibilities for the re-appropriation of the semi-private patient room in contemporary American healthcare, largely due to the longer lengths of stay experienced by patients awaiting transplant surgery and the often ongoing rehabilitation that might be involved after surgery. Depending on the type of transplant patient, the average length of stay can vary from eight to ten days and on up to two to four months at a time.



51. The site for this project is MUSC in Charleston, South Carolina.

Patient populations, such as transplant patients, usually require longer lengths of stay at the hospital, as well as ongoing treatment with multiple visits and stays at the hospital, making these patient care scenarios particularly suited for a semi-private patient room model. The opportunity exists for patients to benefit from developing relationships with other patients during extended periods of hospitalization. It gives them the chance to offer one another encouragement and support throughout the duration of their illness.

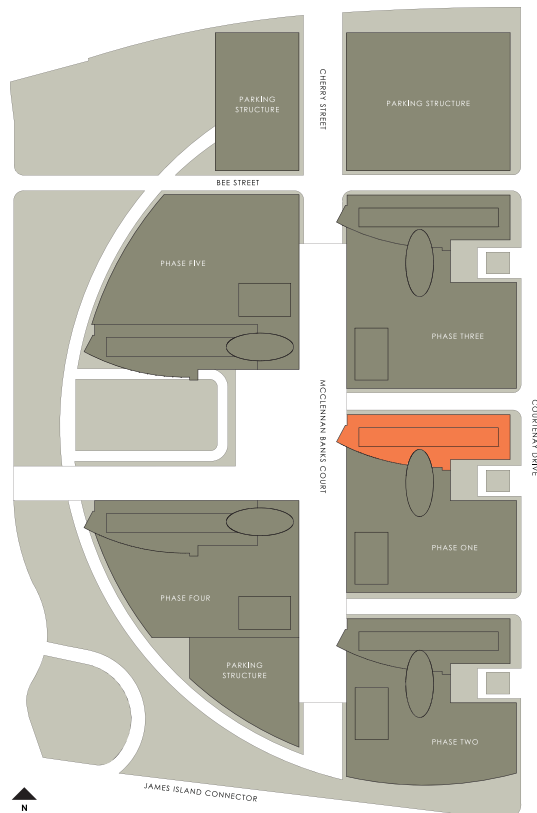
Situated in the heart of Charleston, the Medical University of South Carolina (MUSC) is the only hospital facility in the state of South Carolina with a transplant center. The transplant center at MUSC offers patients a wide range of transplant services, however there are only two dedicated inpatient units for transplant patients. One unit is entirely devoted to the care and recovery of bone marrow transplant patients, which tend to be the sickest patients and generally require isolated positive pressure patient rooms due to their suppressed immune systems. This transplant patient group was immediately eliminated as it was an inappropriate application. The other dedicated transplant inpatient unit at MUSC is for kidney transplant patients waiting for and recovering from surgery. Kidney transplant patients are not as immuno-compromised as bone marrow transplant patients, making them a more qualified patient care scenario for the application of the redesigned semi-private patient room.



52. Exterior photograph of the new Ashley River Tower at MUSC.

Anecdotal evidence from a site visit to MUSC offered insight from the nurses and nurse managers of the kidney transplant unit, indicating that this patient population might in fact be suited for the application of a semi-private patient room. In addition to the acuity level, kidney transplant patients often experience a need for emotional empathy and support prior to and after transplant surgery. This condition generally tends to be ongoing, requiring visits and stays to the hospital before, during and after surgery for rehabilitation, providing patients a real opportunity to build and benefit from lasting relationships.

To ground this study in an existing nursing unit, the new Ashley River Tower at MUSC was selected to evaluate the validity of the redesigned semi-private patient room within an actual patient care context. The renal transplant inpatient unit, located on the fourth floor of the recently built inpatient tower, has been chosen as the patient care scenario and site context for the redesigned room. The intention of the redesigned room is that it would satisfy, to the fullest extent possible, the design guidelines originally established to inform an improved, more applicable semi-private patient room model for the contemporary American healthscape.



53. The masterplan for MUSC, highlighting the Ashley River Tower.

The Ashley River Tower is the first to be built of what is intended to be a larger master planning undertaking for MUSC's campus. The identical tower is planned to be repeated another five times as MUSC continues to grow and need more, newer facilities. The Ashley River Tower was a part of phase one of MUSC's expansion and is located in the middle of MUSC's future campus, as illustrated in the diagram to the left.

An initial analysis of the renal transplant unit at MUSC reveals average travel distances in relation to newer nursing units being built in the United States as for every 30' of corridor traveled a nurse can care for two patients in two separate patient rooms. The unit has a 30' by 30' structural grid, accommodating two typical private patient rooms per 30' bay. In actuality, the furthest patient room from the central nurses' station requires staff to travel approximately 110 linear feet of corridor, while the furthest patient room from the central support core requires nurses to travel 111 linear feet of corridor. The renal transplant inpatient unit is comprised of 21 identical, universal private patient rooms at 290 net square feet of space per room, including the toilet room adjoined to each room. The rooms are arranged in a mirrored configuration across the unit with a decentralized, distributed nurse work station between every other patient room. The total departmental gross square footage of the renal transplant unit is 17,048 S.F. with 39% of that space dedicated to patient care,

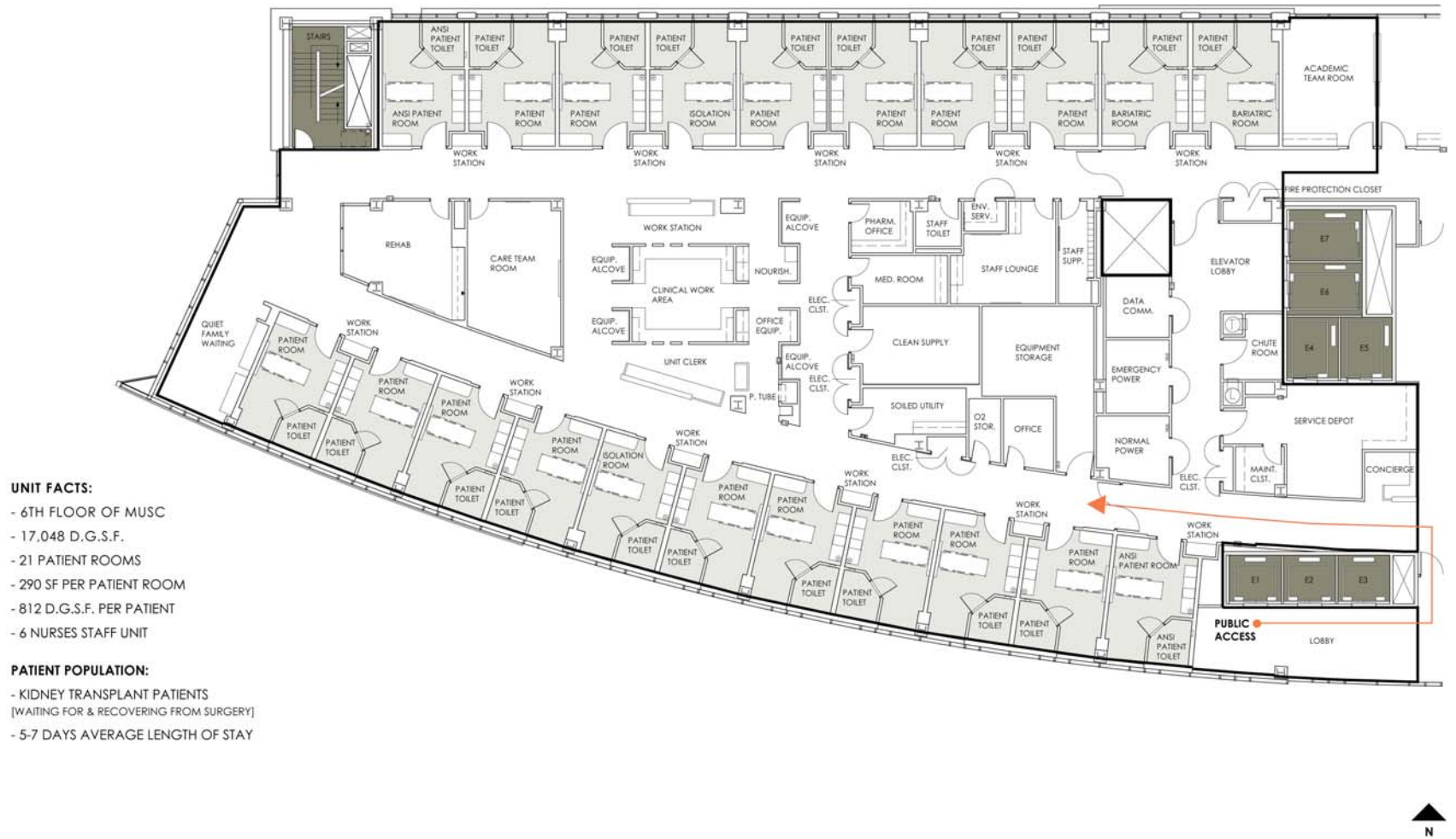
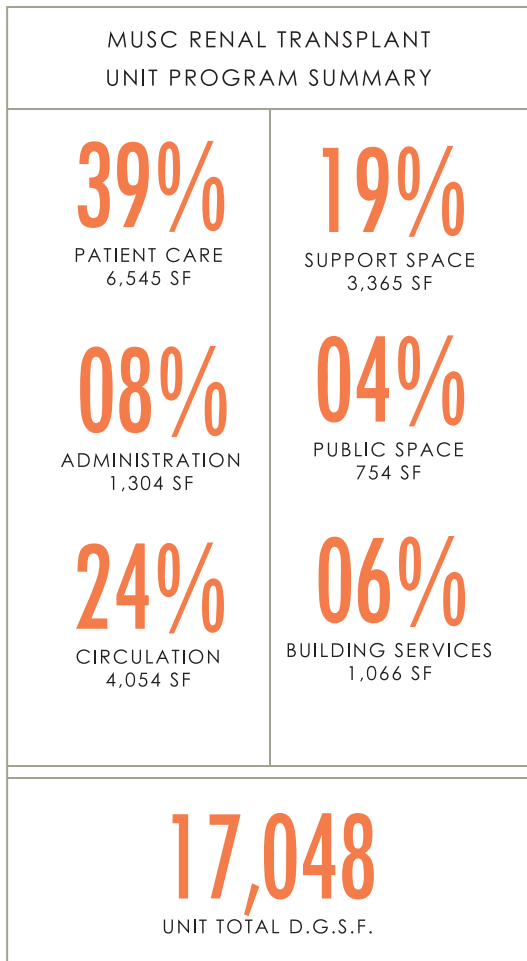


Figure 54. The renal transplant unit at MUSC (D.G.S.F. has been demarcated with a thick black line).



55. Existing nursing unit program summary with all private patient rooms.

24% to circulation, 19% to support space, 8% to administration, 6% to building services, and 4% of the square footage of the renal unit to public spaces. The functional breakdown of the unit will be important for evaluating the impact of the redesigned semi-private patient room on the unit and how the dedicated patient care space is affected. When analyzed in relation to the patient care unit, there is an average of 812 departmental gross square feet per patient bed. Ultimately, the goal is to decrease the departmental gross square feet across the unit required to care for the same number of patients with the implementation of the redesigned room, in this case 21 patients.

In order to fully visualize and understand the renal transplant unit at MUSC’s new Ashley River Tower, a site visit was made to speak with staff and document the context of the Ashley River Tower, but more importantly to select the specific inpatient unit for the project. An informal conversation with the nurse manager on the selected patient care unit provided anecdotal information that further validated the renal transplant unit as a very viable option. The majority of the kidney transplant patients being cared for on the unit are children, in fact it is primarily a pediatric transplant unit. Pediatric patients are likely to benefit from the socialization aspect of sharing a room with other children as well. Another possible advantage of two children sharing a room is the unique opportunity for the neighboring

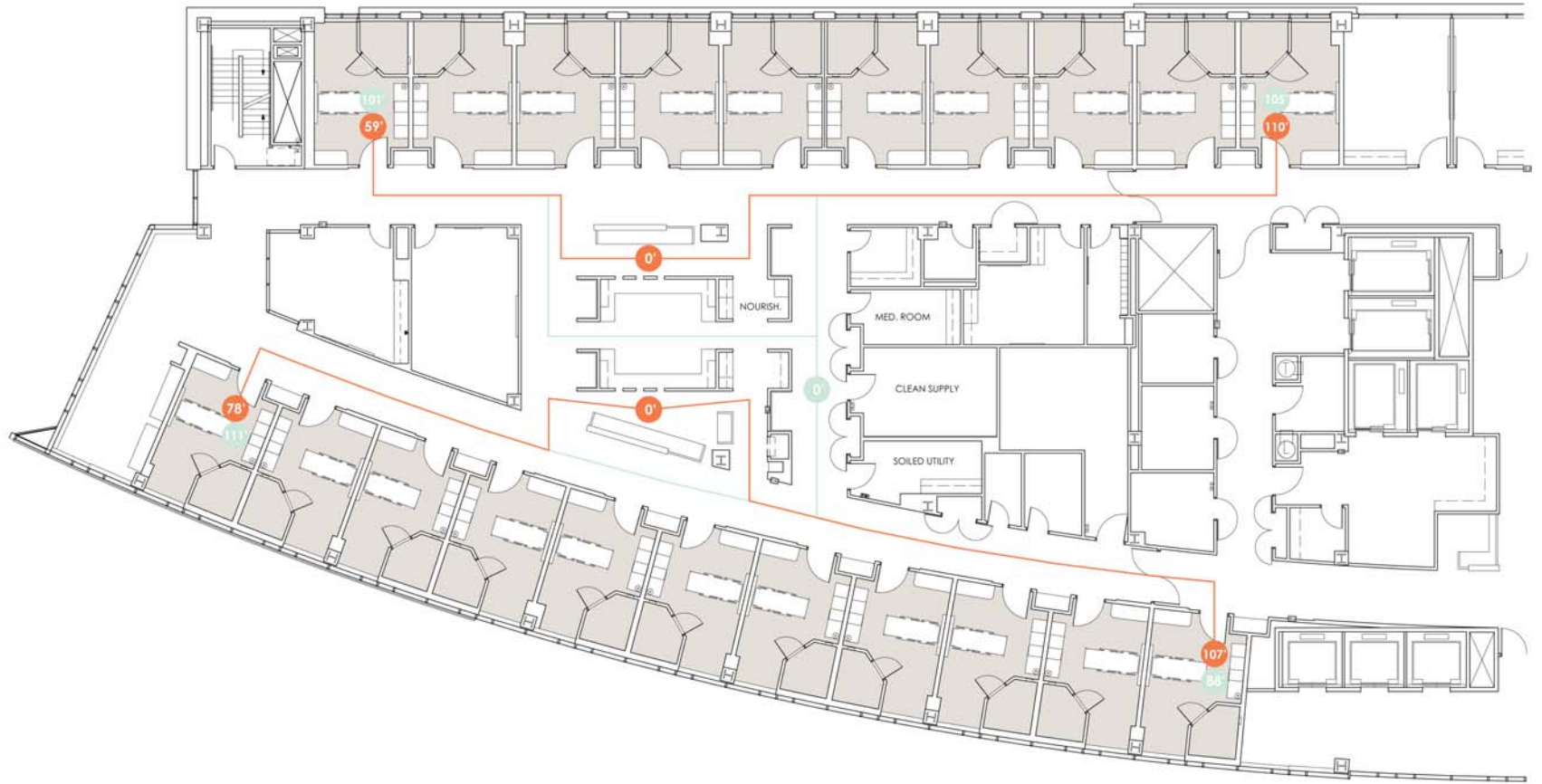


Figure 56. Travel distances analysis of nursing unit.



57. Existing private patient room at MUSC.



58. Existing patient room foot wall and toilet room at MUSC.

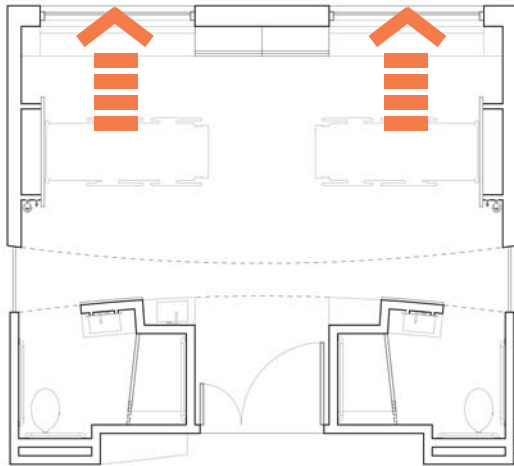
patient's family to participate in the care and observation of the other child. Families with children in the hospital are inclined to stay as much of the time as possible in the room of their child during their stay. It might offer the families support, as well, to know that they can take a break and leave the hospital for a couple of hours because there is another family in the room caring for their child. The increased observation of pediatric patients also contributes to the overall safety of them during their stay.

Photo documentation of the inpatient unit at the Ashley River Tower illustrates the generous private patient room size allotted to each patient staying on the unit. The toilet room offers patients and staff an open, unrestricted layout for toileting and showering in the room. A relatively small family zone is provided for patients' visitors and families due to the outboard toilet arrangement, which also inherently limits the patients' access to daylight and views onto nature.

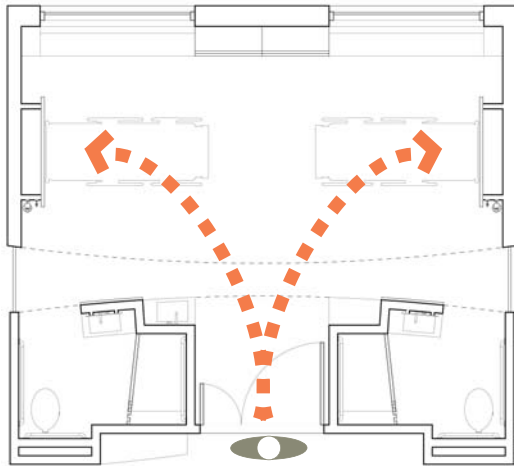
The Architectural Proposal

Design Requirements: The initial design study began with a thorough exploration of the essential spatial elements needed at a minimum in a semi-private patient room: two patient beds and the required clear space around them, a patient toilet room, a staff sink and staff work areas, and family accommodations. In addition to the minimal requirements, the redesigned semi-private patient room should also include an additional toilet room, so that there is one per patient, as established in the design guideline sanitation separation. If the patients are placed on separate headwalls, medical gases, ventilation, and lighting will need to be included for each patient's personal space. Reference the Room Data Sheet in the Appendix of this thesis for a detailed illustration and list of the room requirements for a semi-private patient room (www.nih.gov).

Design Process and Features: Of primary importance was discovering the optimal relationship of the patient beds to each other in order to satisfy the design guidelines previously established at the onset of the redesign. This relationship was evaluated and studied through designing and building a series of parti models in order to determine which design offered the greatest amount of advantages to the patients, staff and family that would



59. Equal access to views and natural light.



60. Equal access from the corridor for staff visibility.

be utilizing the room. After considering several various iterations, the mirrored bed condition revealed itself to be the best arrangement in response to the pre-established design guidelines. Mirroring the beds, directly opposite from one another, inherently proffers equality in experience between the patients, including equal access to daylight and views onto nature, equal access from the corridor for staff visibility, and the potential for equal access to each patient's individual toilet room. In addition to providing a comparable patient experience to each of the patients sharing the room, locating the patient beds on different headwalls intrinsically provides an opportunity to design a family zone for each patient adjacent to the patients' beds. Once the relationship of the patient beds had been established within the room, a parallel study emerged exploring various possible toilet room scenarios and arrangements. To help alleviate the difficulty staff can have, it was important to provide direct access from the patient bed to the toilet. Placing the hand washing sink near the entrance of the toilet room was another consideration that drove the direction of the overall design.

To determine the success of the redesign, the reconceived semi-private patient room was evaluated against the design guidelines instituted prior to design. The room was analyzed based upon the design provisions, such as separate toilet rooms and family accommodations

for each patient's family, uniquely incorporated into the room for the patient, for the staff, and for the family and visitors of the patients.

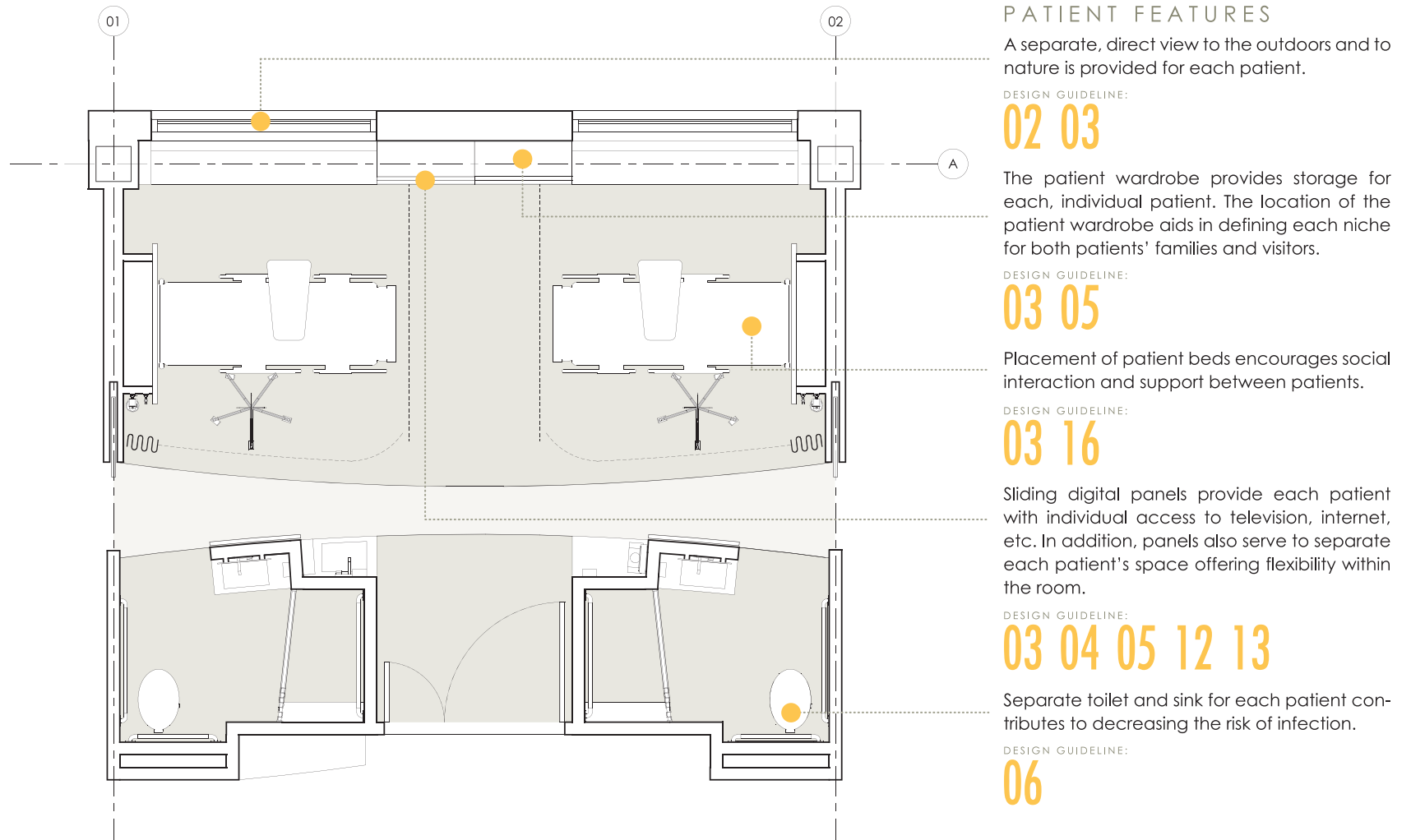
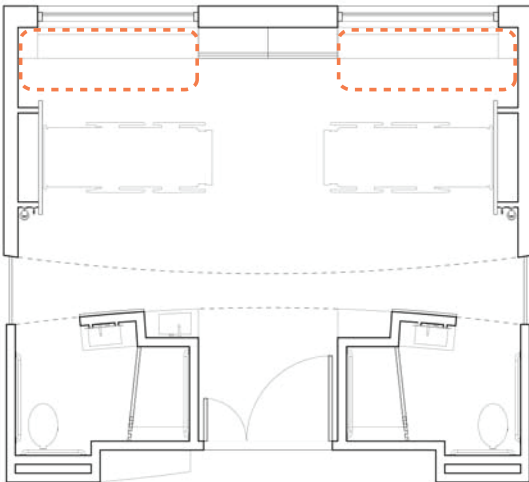


Figure 61. Redesigned semi-private patient room: patient feature evaluation.



62. Patient bed arrangement encourages social interaction.

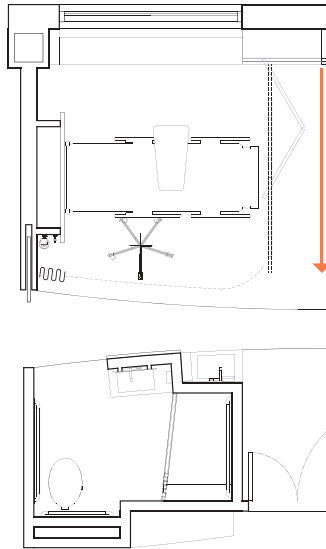


63. Patient wardrobe defines separate family spaces for each patient's family.

Patient Features: Patient features of the room were given priority and the redesign was first evaluated for the inclusion of unique design strategies meant to enhance the patient experience during their stay in the hospital. Separate, direct views to nature and equal access to daylight was included for each patient, accounting for the design guidelines speaking to views and natural light as well as personal space, by placing patients on separate headwalls which allowed each patient equal access then to the window in the exterior wall.

The patient wardrobe provides storage for each, individual patient. The location of the patient wardrobe also serves to define each niche meant for both patients' families and visitors, contributing to the design guidelines personal space and family niches. The role of the patient wardrobe is not just for the storage of patient and family belongings, but is also meant to be the "resting" position of the digital sliding panels, so that they remain centrally located within the patient zone.

The initial placement of patient beds is intended to encourage social interaction and support between patients. Sliding digital panels provide each patient with individually controlled access to television, internet, etc. In addition, the panels also serve to separate each patient's space offering flexibility within the room. The decision to include movable, sliding panels was



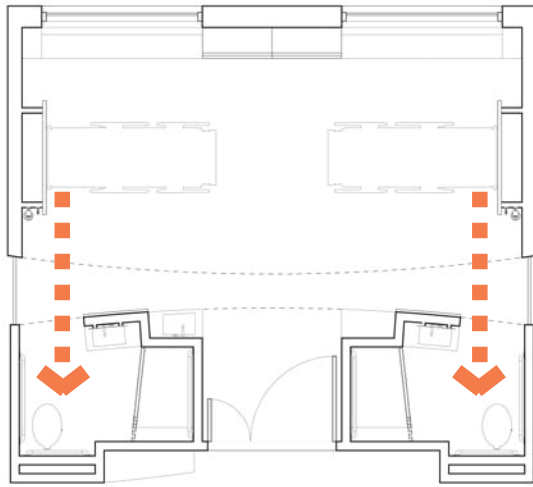
64. Sliding digital panels diagram.



65. Sliding digital panels illustrative vignette.

also driven by the desire to be able to offer patients sharing a room a greater degree of privacy than what is provided in the traditional semi-private patient room. The original idea behind them was to provide each patient with their own personal “foot wall” essentially in the room. Since the patient beds were arranged directly across from one another, there was not a physical wall to satisfy the role of foot wall. Traditionally, the foot wall in the patient room is where one might locate the patient’s television. Not having this provision led to the idea of sliding panels that might utilize digital surface technology, housing each patient’s television, internet access, and even their connection to the resources and programs provided within the hospital system. It was also intended for both patients to have individual control over their personal footwall, so two were provided, one for each patient.

The potential for conflicting entertainment activities presented a challenge unique to the semi-private patient room. For conflicting projected sound, technology exists to rectify this situation. Focused sound is one example that might be employed to alleviate the issue that may arise if both patients would like to watch different programs at the same time. Focused sound works to contain projected sound to a single, “focused” direction, intended for only one person. The sound emits the equivalent of a laser, directed at one person, so that a person sitting 3’ away, for example might not be able to hear anything that the person receiving the



66. Redesigned semi-private patient room provides each patient with their own toilet room.

sound is hearing. Designing flexibility and adaptability into the room allows patients to attain a little more control over the acoustic environment within the room depending on their needs at the time.

Accommodating the sanitation separation guideline, each patient was given a separate toilet room including toilet, shower and sink in an effort to contribute to decreasing the risk of hospital-acquired infections. The location of the toilet room, and the arrangement of the elements within, was given a substantial amount of consideration through the design process as to what would be the best solution for a redesigned semi-private patient room. Accessing the toilet within the room usually involves the patient and at least one nurse helping them onto the toilet, so the relationship of the toilet to the entrance of the bathroom and the open space around the toilet were important factors in the design of the bathroom. The most private part of the bathroom, referencing the privacy variance diagram, seemed most appropriately reserved for the shower. The hand washing sink was located as close the entry/exit of the bathroom as possible to remind those that it is the last thing they need to do before leaving the toilet room.

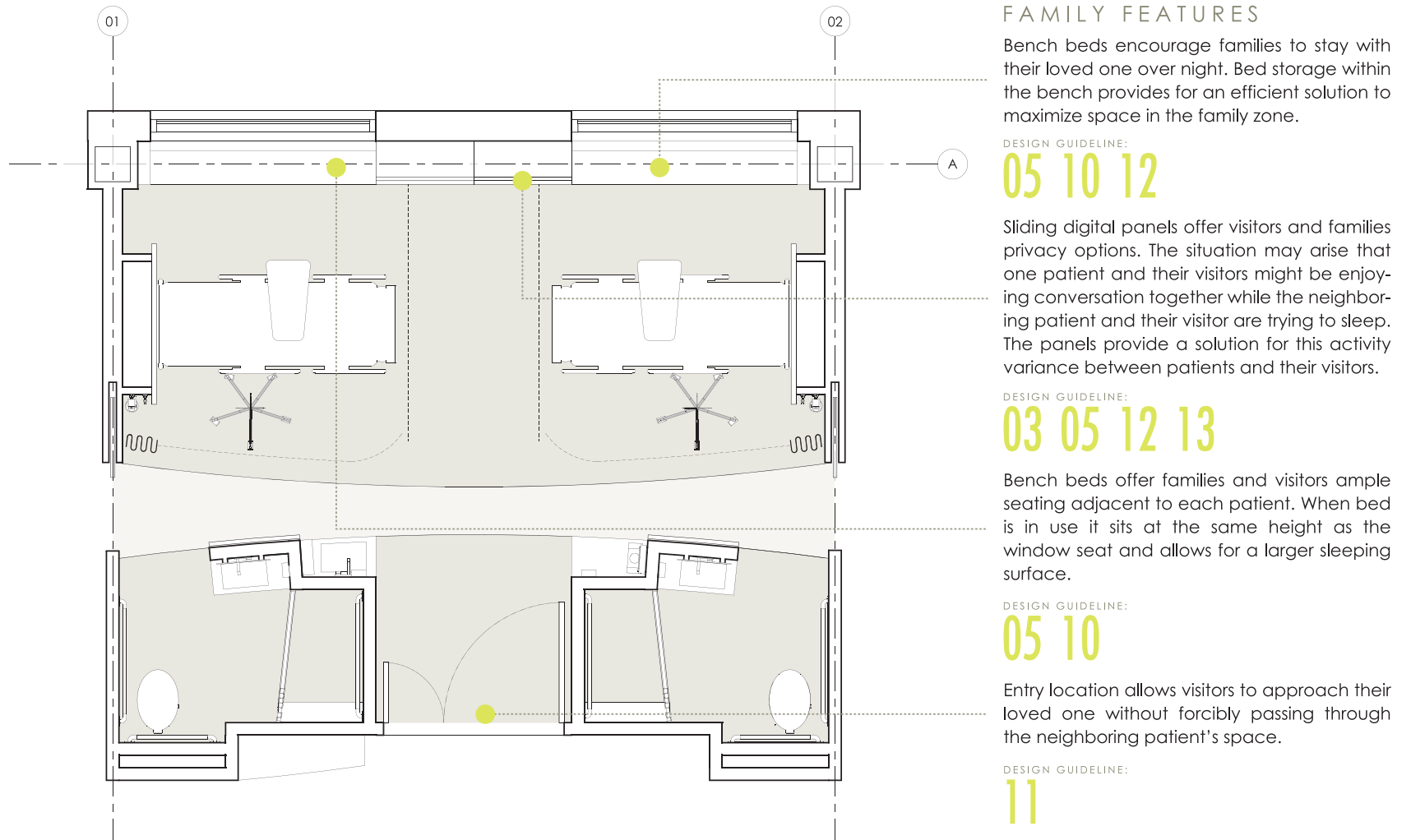
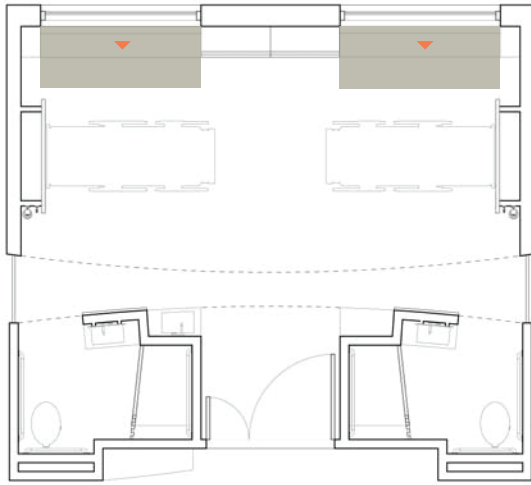


Figure 67. Redesigned semi-private patient room: family feature evaluation.



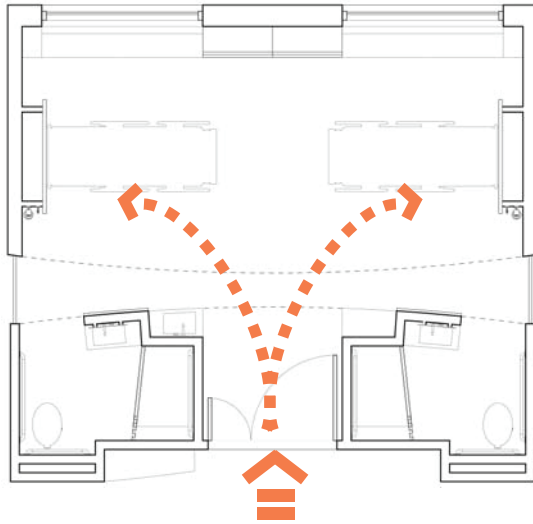
68. Visitor bench beds extend toward patient beds to provide accommodations for families to stay overnight.



69. Sliding digital panels provide flexibility within the room.

Family Features: Families have really assumed a greater role in patient care in American hospitals today and it is important to not only acknowledge this in a redesign, but to accommodate the patient's family adequately and comfortably. Bench beds along the window wall offer each patient's families and visitors ample seating adjacent to the patient beds. The bench beds are also intended to encourage families to feel welcome to stay with their loved one over night. Each bench bed has the ability to pull forward towards the patient bed an additional 1'-2". The back cushion then lays flush with the seat cushion, forming a comfortable sleeping surface for patient families who might desire to stay the night with their loved one. Furthermore, bed storage within the bench provides for an efficient solution to maximize space in the family zone. When the bed is in use it sits at the same height as the window seat and allows for a larger sleeping surface. Giving each patient's family and visitors their own dedicated zone within the semi-private patient room is unconventional and is intended to draw on a feature that is often highlighted in the contemporary private patient.

The sliding digital panels offer families and visitors privacy options. The situation might arise that one patient and their visitors might be enjoying conversation together while the neighboring patient and their family member are trying to sleep. The panels, in tandem with



70. The entrance allows visitors to approach their loved one without entering the other patient's personal space.

the bed arrangement, provide a solution for these activities to occur simultaneously within the same room.

The entry and arrival sequence in the proposed room is one that in actuality was non-existent in American semi-private patient rooms of the past. Aligning both patient beds next to one another along the same headwall inherently meant that one patient was closer to the entrance and would then have to be passed by to arrive at the patient staying in the bed closer to the window wall. The entry location in the redesigned semi-private patient room allows visitors to approach their loved one without forcibly passing through the neighboring patient's space. Patient families have taken on an important role in patient care today, and providing for the needs of families and visitors is relevant and vital in patient room design for contemporary American hospitals.

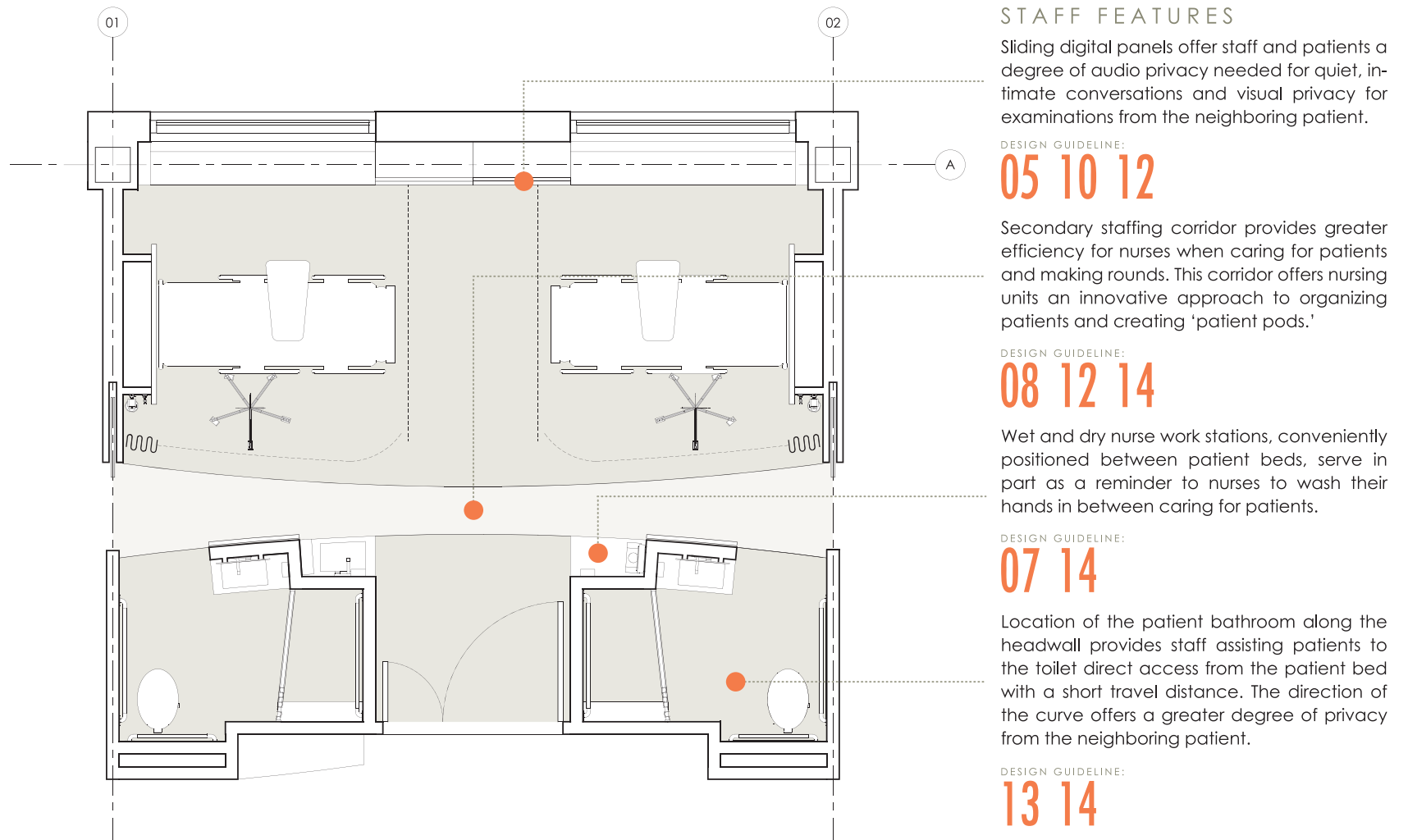
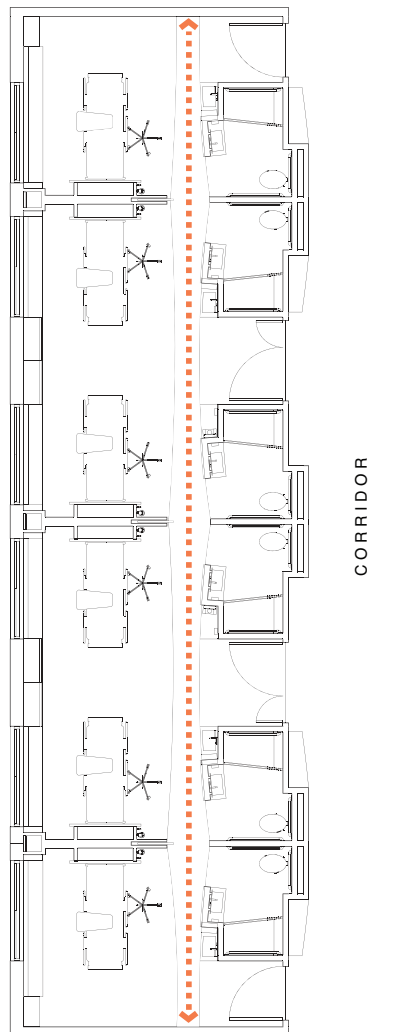


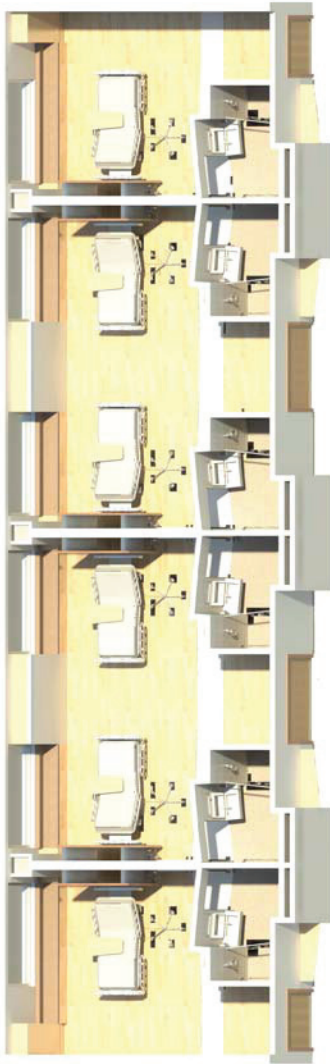
Figure 71. Redesigned semi-private patient room: staff feature evaluation.



72. Staff passageway connects patient rooms to form a suite.

Staff Features: To ensure that the redesigned patient room would be operationally efficient and provide an environment for nurses to be able to deliver effective patient care, the redesign also accommodated for the needs of caregivers as well. The sliding digital panels were also meant to serve the staff by offering a greater degree of both visual and auditory privacy than what is traditionally provided for by the cubicle curtain. A semi-private patient room design must respond to the fact that patient examinations will still occur and quiet, intimate conversations will still be had by patients sharing a room. And while the sliding panels does not wholly satisfy either need, it certainly offers an improvement upon what is conventionally provided in semi-private patient rooms.

The separate staff passageway between rooms, a unique feature of the redesigned room, was specifically intended for a greater level of staff efficiency on the unit by providing a direct portal for staff to travel between patient rooms, rather than moving in and out between patient rooms and the corridor beyond. This passageway offers nursing units an innovative approach to organizing patients as it is meant to provide flexibility in the number and type of rooms that are actually accessible to each other. Wet and dry nurse work stations, centrally positioned between patient beds and the entrance to the room, serve in part as a reminder to nurses to wash their hands in between caring for patients.



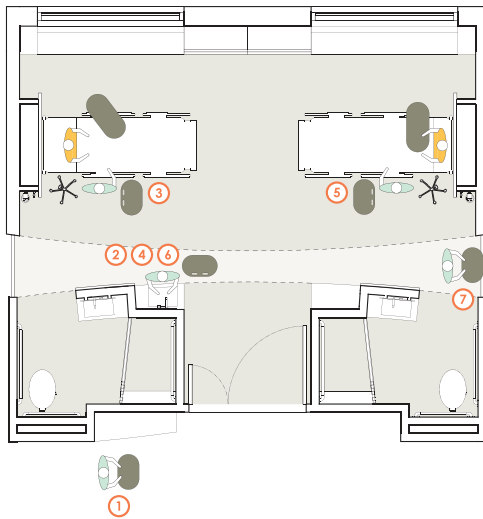
73. "Patient suite" concept rendering.

The hand washing sink is conveniently in the direct path of travel between patients, between patients and the entry to the room, and along the secondary staffing passageway. The location of the patient bathroom along the headwall provides staff assisting patients to the toilet direct access from the patient bed with a short travel distance. Furthermore, the placement of the bathrooms within the redesigned room minimizes the distance for patients using the toilet on their own, eliminating the need for a patient to maneuver around the bed of the other patient to access a shared toilet as is common in conventional semi-private patient rooms. The direction of the curve along the staffing passageway offers a greater degree of privacy in the bathroom from the neighboring patient. The expectation of the redesigned room was that it would satisfy and address as many of the design guidelines meant to provide a comfortable setting for the patient, an adequate zone for families and visitors, and an operationally efficient and effective environment for nurses to deliver care.

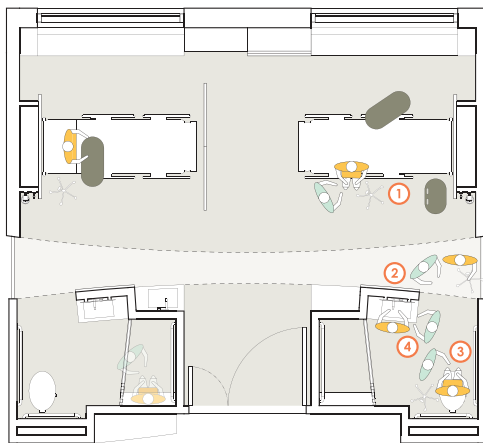
A tangent study that emerged from the redesign of the semi-private patient room attempted to address the greater efficiency and utilization of the semi-private patient room on the patient care unit. Addressing one of the primary goals of the semi-private patient room redesign, the notion of "patient suites" was conceived in order to provide a more efficient way for nurses to deliver care to their patients. The patient suite allows nurses to work more efficiently within a

suite of rooms and provide back-up to each other within the suite. And, per each hospital, and even more specifically, per patient care scenario, the layout of the suite is flexible and can adapt to changing caregiver workload and the needs of both the unit and the hospital. The suite is comprised of a combination of private and semi-private patient rooms, dependent on the nature and the needs of the patient population in which it is situated. The ratio of private to semi-private as well as the arrangement of the room models can be mixed and matched multiple ways. Each room located within the suite is connected by a subtle staff passageway that allows nurses to move freely between the rooms without moving in and out of rooms and corridors. Instead, sliding doors, similar in concept to what one might see moving between the cars of a train, provide a seamless path of travel for nurses to traverse through, offering more efficient care to the patients they are responsible for. This idea of connection also lends itself to greater visibility of the patients by the staff as they are able to care for patients in one room, while maintaining auditory, and at times, visual supervision of other patients in other rooms.

Task Analysis: In addition to evaluating the room against the design guidelines, it was important to analyze the room based on the various tasks that might take place in the redesigned semi-private patient room. Understanding the space and attempting to predict



74. Task analysis diagram: nursing care.

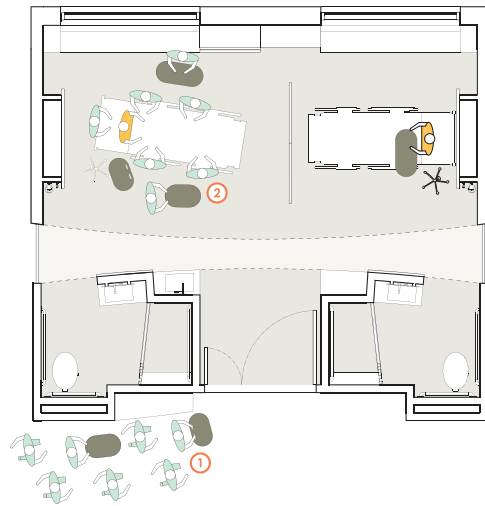


75. Task analysis diagram: bathroom transfer.

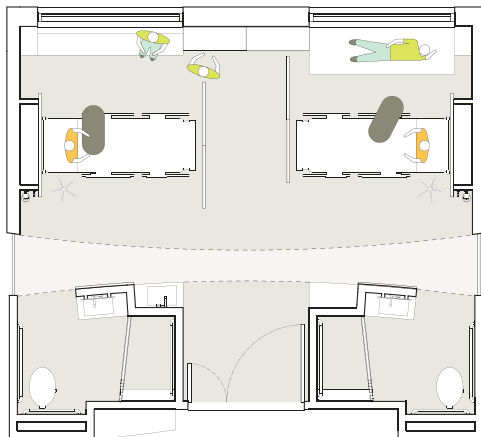
how it might be used by staff, patients, and visitors was the approach to this evaluation. Beginning with nursing care, upon entering the room staff must immediately walk by the wet nurse work station reminding nurses to wash their hands prior to engaging in patient care. With plenty of space around the beds, nurses should be able to easily maneuver within the room and between the two patients. The sliding panels of the neighboring patient can also be drawn out to provide an increased level of privacy for the patient currently being cared for. Nurses can conveniently move between each of the patients they are caring for utilizing the staffing passageway and the patient suite concept.

Transferring the patient to the bathroom was also studied to verify that enough space was allotted for the maneuvering required to get patients from the patient bed to the toilet or the shower. The toilet room is located along the same headwall as the patient bed, offering opportunity for support as a patient moves from the bed directly to the toilet.

Inherently one of the most space intensive activities, a patient code scenario often draws more people and machines to a patient room than anything else. A typical code might require seven staff and three pieces of equipment simultaneously around the patient bed. Locating the patient beds on separate headwalls intrinsically provides a greater amount of space transfer.



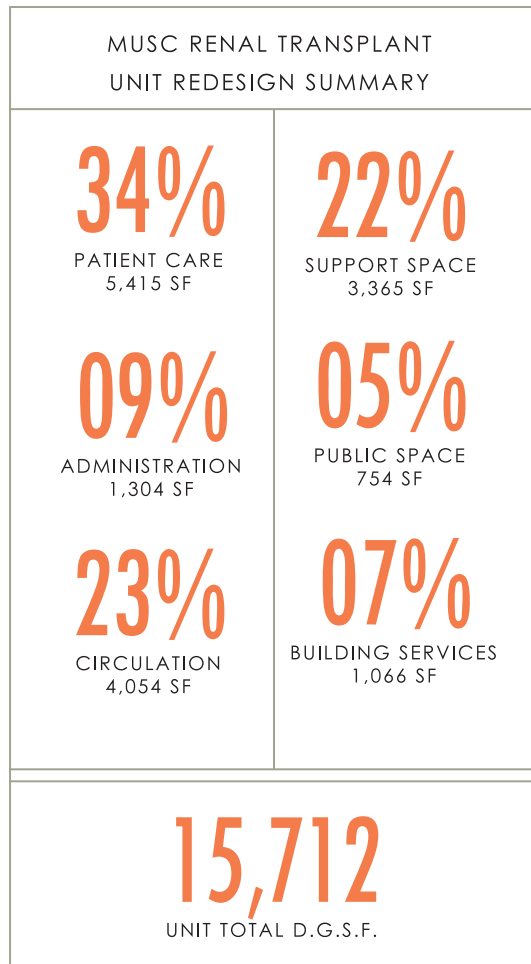
76. Task analysis diagram: patient code.



77. Task analysis diagram: family.

around the patient beds than if they were side by side along the same headwall, as what can be experienced in a traditional semi-private room model. To offer some privacy from the situation, the neighboring patient's sliding panels could be pulled [as illustrated in the diagram] to visually shield them from what is going on.

During a patient stay, the patient's family and visitors might endure long days and long nights in the patient room. Providing for the various needs that the family might encounter during that stay is optimal. The bench bed offers families and visitors a place to sit and visit near their loved one during the day. During the night if a family member would like to stay in the patient room, the bench bed pulls out to offer twice the surface area, providing a generous sleeping space. The sliding panels also serve to distinguish one patient's family zone from the next, giving the space a higher degree of adaptability to be able to suit the needs of each and patient and their visitors.



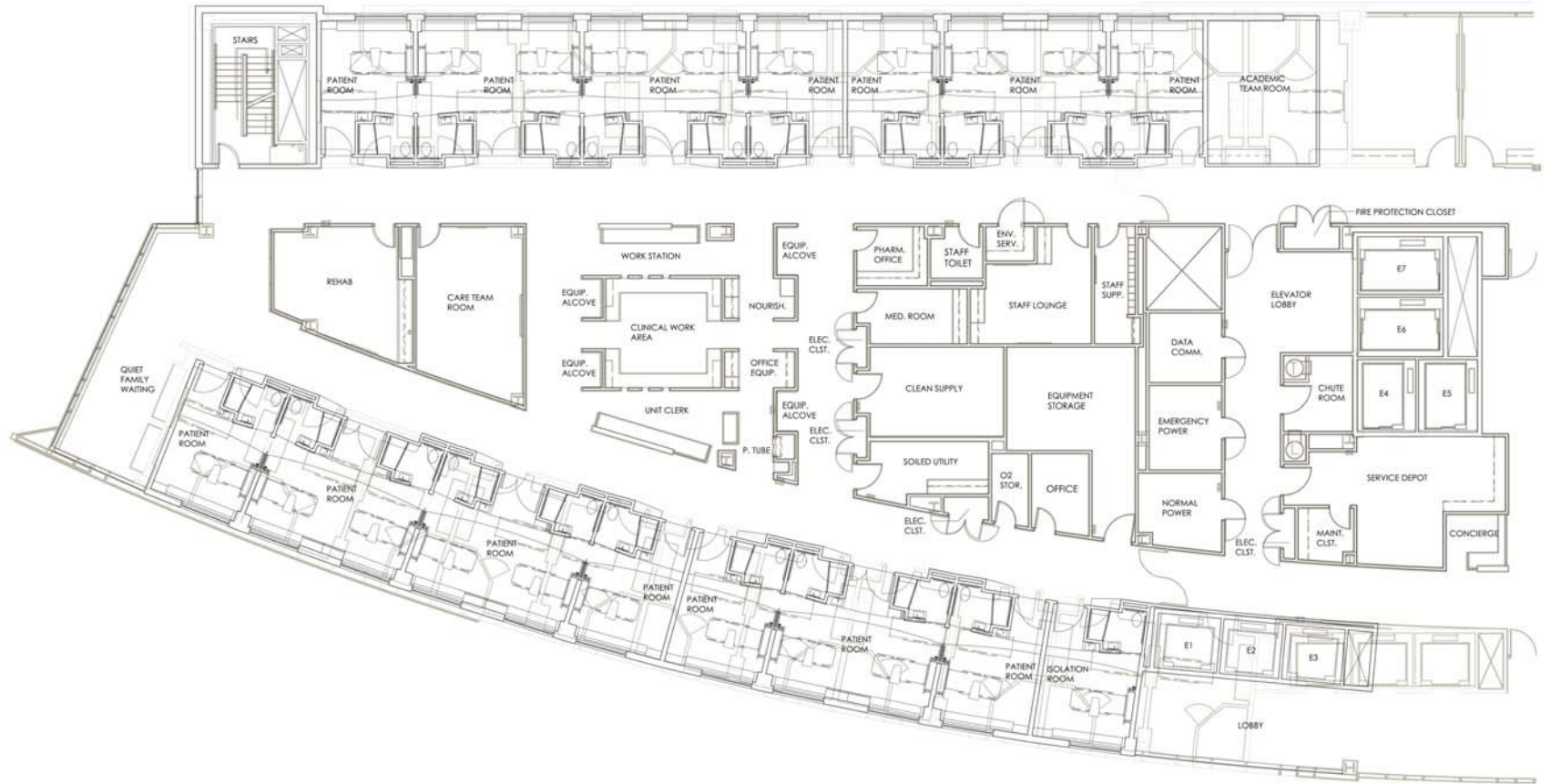
78. Nursing unit redesign program summary.

Conclusion

The final evaluation of the room sought to quantify the impact the redesigned semi-private patient room might have across the patient care unit at the Ashley River Tower of MUSC, previously determined as the site and context for this thesis exploration. Imposing the redesigned semi-private patient room on the unit, in the context of the patient pod, six semi-private patient rooms in tandem with nine private patient rooms were utilized to accommodate the 21 patients. This particular combination of rooms translated into a reduction of 1,336 departmental gross square feet. Rendered per patient, 66 net square feet per patient bed was saved across the unit. This decrease in square footage might initially seem minimal, but when applied across a 300 bed hospital, it produces significant savings. Assuming a construction cost of \$350 to \$400 per square foot and a space saving of 1,336 square feet across the kidney transplant unit at MUSC, a potential \$467,600 could have been saved. And, this amount is only totaled for one patient care unit at MUSC. A substantial cost savings could really be experienced if the identical situation were then applied across the entire hospital. In addition to the overall square footage savings and upfront cost savings, travel distances for caregivers were also reduced. The furthest travel distance from the central nurse work station prior to the inclusion of the redesigned room was 110 linear feet. After the



79. Travel distances analysis of redesigned nursing unit.



80. Nursing unit redesign overlay with existing MUSC nursing unit in grey.



81. Perspective view from staffing passageway.

implementation of the redesigned semi-private patient room and the use of the patient pod concept across the unit, the 110 linear feet was reduced to 90 linear feet.

While difficult to quantify in this conceptual study, it is assumed based on the above information that a potential improvement in staffing efficiency and patient care would also be experienced by the patient care unit by decreasing extraneous staff travel distance/time as well as the staffing workload. It is also implied that a departmental square footage savings would translate to some degree to an overall reduction in carbon footprint, assuming a generated savings in materials, embodied energy, and energy consumption.

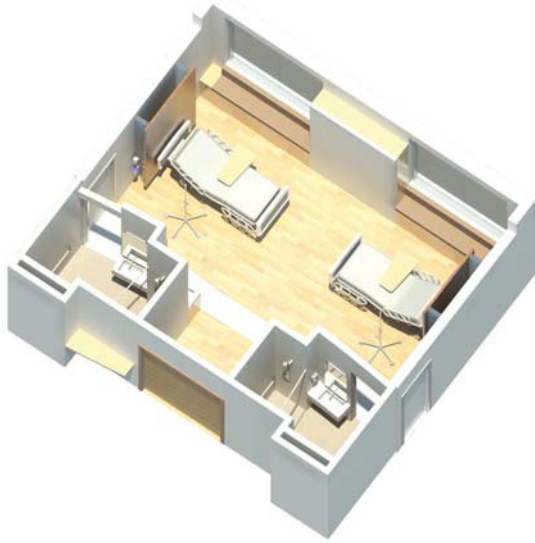
Invariably, there were a number of limitations to this thesis study that should also be acknowledged. A solid and somewhat grounded argument still remains in favor of the private patient room, and the influences that have driven American healthcare in this direction are legitimate. Issues surrounding HIPAA and complete acoustical privacy for patients sharing a room have yet to be resolved within a semi-private patient room. This may be an inherent limitation to the semi-private room model, however with further design study, technological innovations and exploration a solution might still remain to be found that offers patients and



82. Perspective view from visitor's bench bed.

staff the level of privacy need to have for conversations pertaining to their illness. Culture was not fully considered as a part of this study, however the United States is generally a more privatized culture. The American culture is potentially a larger factor influencing the move to all-private patient rooms. Inherently, all-private patient room hospitals provide the opportunity to achieve 100% patient occupancy levels; however, the reality is that this is never really maintained as patients are constantly being turned over and rooms are being cleaned. The fact still remains though that the utilization of private patient rooms versus semi-private patient rooms allows the nursing unit to fill with less complication than semi-private patient rooms, given the potential for gender and personality conflicts. In addition to these limitations, it must be acknowledged that the actual savings in cost and carbon footprint need further study, as this was beyond the scope of this thesis study.

This study is, however, among few devoted to advancing semi-private patient room design and application within the healthcare system today to address pressing issues of healthcare costs, sustainability and operational efficiencies while simultaneously developing responses to environmental factors. Further, this study serves as an opportunity to better understand the benefits and limitations of both the private and semi-private patient room models as current empirical evidence remains limited. At the beginning of this study, it was anticipated, as well,

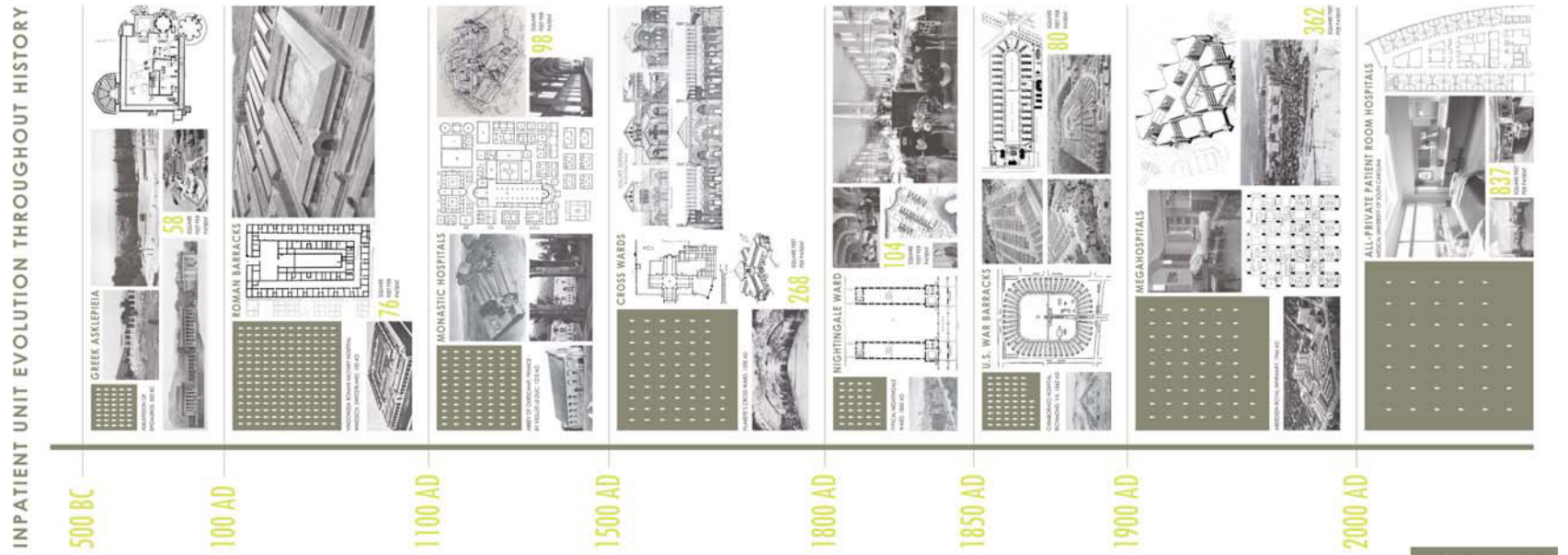


83. Redesigned semi-private patient room axonometric.

that this research and thesis would aid in reconciling the perceptions people may have of the semi-private patient room, be they experiential or functional, grounded in evidence or mere perceptions founded in opinion, with the design possibilities that still have yet to emerge from this neglected patient room model. Within the framework of the global issues at hand in the twenty-first century, a period newly cognizant of the urgency of adopting a more economically and environmentally sustainable approach to the future, healthcare architects have a responsibility today to consider their role within the industry to ensure the sustainability of the contemporary hospital. As patient rooms form the basic element of any hospital, this re-evaluation of the evidence supporting the all-private patient room care unit, and in turn the re-conception of the role and design of the semi-private patient room within the hospital of the twenty-first century signifies a potential step toward a new, sustainable model for patient care.

APPENDIX

Oral Defense Presentation Boards



84. Presentation board one: Design Research.

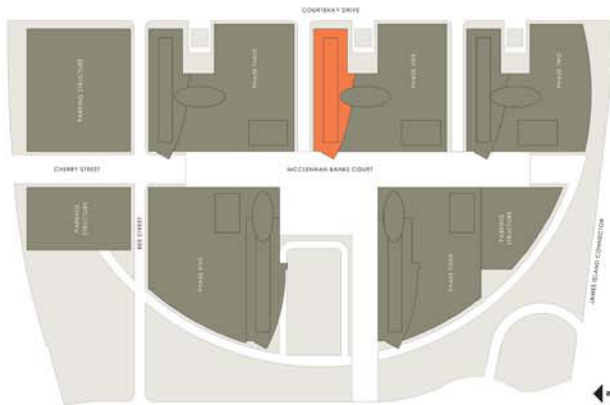
DESIGN GUIDELINES : SEMI-PRIVATE ROOM DESIGN

	<p>01 ROOM SIZE The average private patient room, including toilet room, occupies approximately 350 net square feet of space and is typically 10' x 12'. In some rooms, occupancy may reach 300 net square feet of space per patient, while occupying up to 180 net square feet of space per patient in high-density emergency patient rooms.</p>	
	<p>02 VIEW AND NATURAL LIGHT Each patient should have direct access to the outdoors and view of the outdoors. The room should be designed to maximize natural light. The room should be designed to maximize natural light. The room should be designed to maximize natural light. The room should be designed to maximize natural light.</p>	
	<p>03 PHYSICAL STAGE A degree of physical stage is required of each patient room to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>04 PRIVACY CONSIDERATIONS Each patient has the right to privacy and to control their environment. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>05 FAMILY NICHE The patient's family has a right to be involved in their care. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>06 SANITATION SEPARATION It is not possible to ensure that either the patient or the caregiver is free from contamination. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>07 VIEW PLACEMENT View should be placed in a way that is both functional and aesthetically pleasing. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>08 COMMON VISIBILITY The patient should be able to see their caregiver from the control console. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>09 ARTIFICIAL LIGHTING Artificial lighting should be provided for the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>10 FURNISHINGS AND FINISHES Each patient should be able to see their caregiver from the control console. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>11 ENTRY AND ARRIVAL Each patient should be able to see their caregiver from the control console. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>12 FLEXIBILITY / ADAPTABILITY Patients should be able to see their caregiver from the control console. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>13 PRIVACY / VARIANCE Patients should be able to see their caregiver from the control console. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>14 CARE EFFICIENCY Patients should be able to see their caregiver from the control console. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>15 VENTILATION / SEPARATION Patients should be able to see their caregiver from the control console. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	
	<p>16 SOCIALIZATION AND SUPPORT Patients should be able to see their caregiver from the control console. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs. The room should be designed to support the patient's needs.</p>	

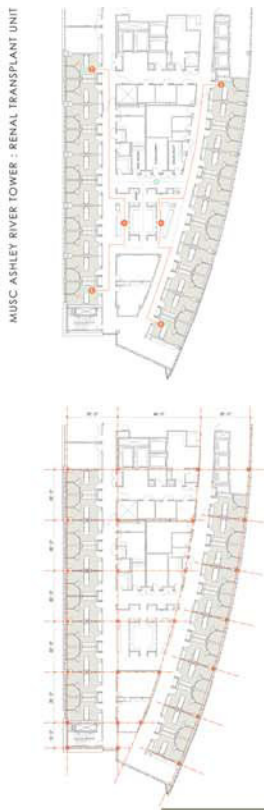
85. Presentation board two: Design Guidelines.

MEDICAL UNIVERSITY OF SOUTH CAROLINA : ASHLEY RIVER TOWER

SITE SELECTION PROCESS: Prior to selecting a physical site for the location of the semi-private room design to be evaluated within, it was important first to identify a patient care scenario which might be more suited than another for the application of a shared patient room model. Transplant patients emerged as a unique possibility for the application, given the longer lengths of stay experienced by patients awaiting a new organ and the often ongoing rehabilitation that might be involved after surgery. Situated in the heart of Charleston, the Medical University of South Carolina (MUSC) is the only hospital facility in the state of South Carolina with a transplant center. To ground this study in an existing nursing unit, the new Ashley River Patient Tower at MUSC was selected to evaluate the success of the redesigned semi-private patient room within the actual context in which it may lie. MUSC is the only hospital in South Carolina that services whole organ and bone marrow transplant patients. Therefore the renal transplant inpatient unit, located on the fourth floor of the tower, has been chosen as the patient care scenario and site context for which the redesigned room will be particularly proposed for, the intention of the redesigned room is that it would satiate, to the fullest extent possible, the design guidelines originally established to inform a better, more applicable shared patient room model for the contemporary American healthcare.



MUSC RENAL TRANSPLANT UNIT PROGRAM SUMMARY	39%	19%	08%	04%	24%	06%	17,048
RENAL TRANSPLANT UNIT	1,131 SF	RENAL TRANSPLANT UNIT	1,382 SF	RENAL TRANSPLANT UNIT	4,512 SF	RENAL TRANSPLANT UNIT	17,048 SF



86. Presentation board three: Design Context.

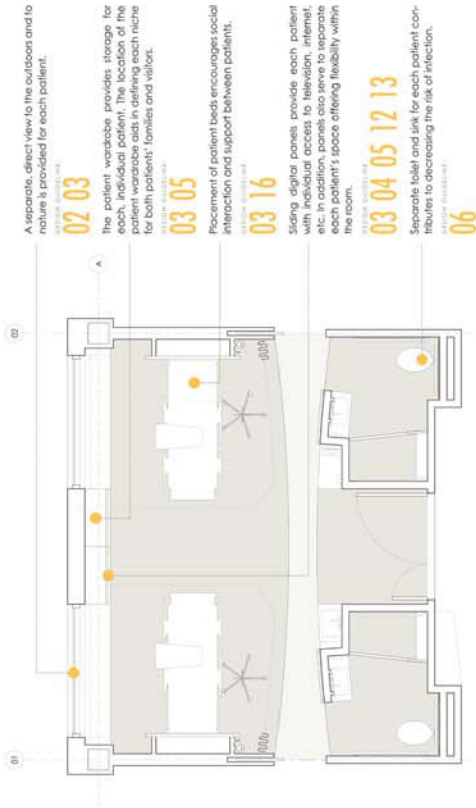
DESIGN PARTIS : MODEL SERIES



04 DESIGN PROCESS

87. Presentation board four: Design Process (included physical parti models mounted to board at presentation).

SEMI-PRIVATE ROOM REDESIGN : DESIGN GUIDELINE EVALUATION



A separate, direct view to the outdoors and to nature is provided for each patient.

02 03
The patient wardrobe, provides storage for each, individual patient. The location of the patient wardrobe aid in defining each niche for both patients, families and visitors.

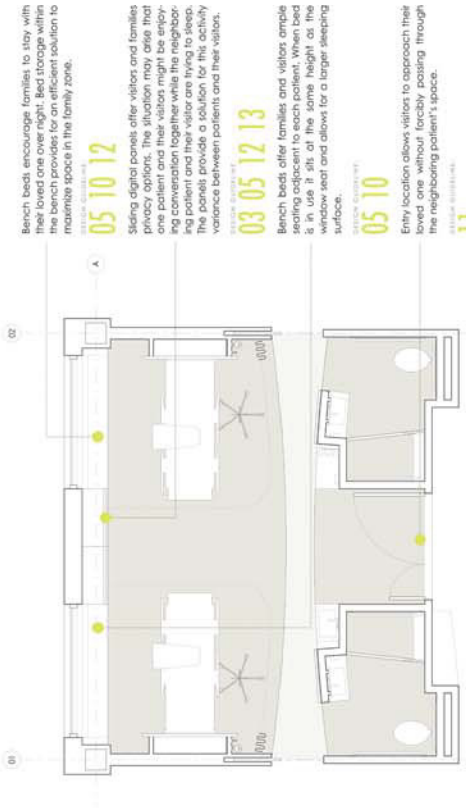
03 05
Placement of patient beds encourages social interaction and support between patients.

03 16
Sliding digital panels enclose each patient with digital access to television, internet etc. In addition, panels also serve to separate each patient's space offering flexibility within the room.

03 04 05 12 13
Separate table and sink for each patient contributes to decreasing the risk of infection.

06

ROOM EVALUATION : PATIENT FEATURES



Bench beds encourage families to stay with their loved one over night. Bed storage within the bench provides the most convenient solution to maximize space in the family zone.

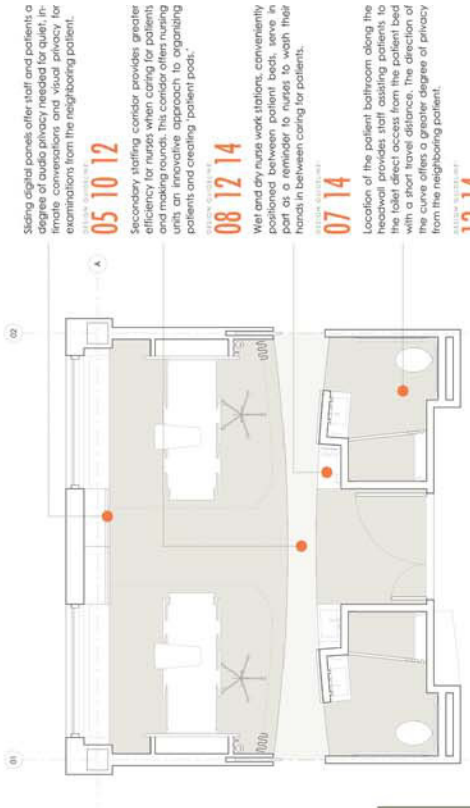
05 10 12
Sliding digital panels offer visitors and families privacy options. The situation may arise that one patient and their visitors might be enjoying conversation together while the neighboring patient and their visitor are trying to sleep. The panels provide a solution for this activity variance between patients and their visitors.

03 05 12 13
Bench beds offer families and visitors ample seating adjacent to each patient. When bed is not in use the sits at the same height as the wall panel and allows for a larger sleeping surface.

05 10
Entry location allows visitor to approach the loved one without forcibly passing through the neighboring patient's space.

11

ROOM EVALUATION : FAMILY/VISITOR FEATURES



Sliding digital panels offer staff and patients a degree of audio privacy needed for quiet, focused conversations and examinations from the neighboring patient.

05 10 12
Secondary staffing corridor provides greater efficiency for nurses when caring for patients and making rounds. This corridor offers nursing unit, an innovative approach to organizing patients and creating "patient pods."

08 12 14
Wet and dry nurse work stations, conveniently positioned between patient beds, serve in part as a reminder to nurses to wash their hands in between caring for patients.

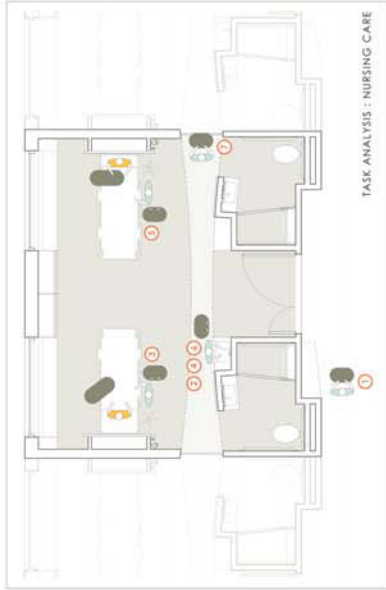
07 14
Location of the patient bathroom along the headwall provides staff assisting patients to the toilet direct access from the patient bed while maintaining the privacy of the care offer a greater degree of privacy from the neighboring patient.

13 14

ROOM EVALUATION : STAFF FEATURES

88. Presentation board five: Design Analysis.

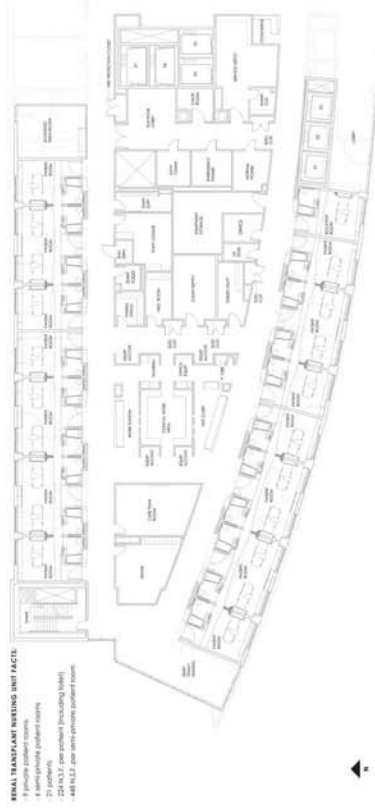
PATIENT ROOM TASK ANALYSIS : DIAGRAM SERIES



DESIGN ANALYSIS

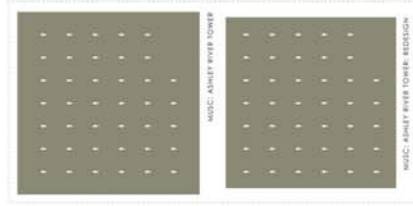
89. Presentation board six: Design Analysis.

SEMI-PRIVATE ROOM REDESIGN : NURSING UNIT EVALUATION



SEMI-PRIVATE ROOM REDESIGN : TRANPOSED ON MIISC RENAL TRANSPLANT UNIT

34% PATIENT ROOMS PER 100 SF	22% NURSE WORK PER 100 SF	09% ADDITIONAL NURSE WORK	05% PATIENT ROOMS PER 100 SF	23% CENTRAL NURSE WORK PER 100 SF	07% NURSE WORK PER 100 SF	15,712 GROSS TOTAL S.F.
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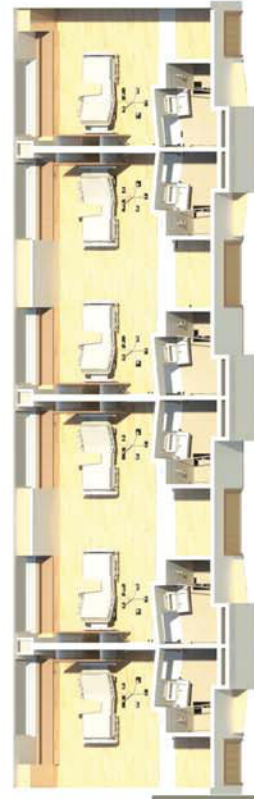


RENAL TRANSPLANT UNIT : TRAVEL DISTANCE ANALYSIS

PATIENT PODS Addressing one of the primary goals of the semi-private patient room redesign, the notion of patient pods was conceived in order to provide a more efficient way for nurses to deliver care to their assigned patients. The idea is that one nurse would be responsible for one pod of patients. And, per each hospital, and even more specifically, per each nursing unit, the layout of the pod is flexible and can adapt to the changing needs of both the unit and the hospital. The pod is comprised of a combination of private and semi-private patient rooms, dependent on the nature and needs of the patient care unit in which it is situated. The ratio of private to semi-private as well as the arrangement of the room models can be mixed and matched multiple ways. Each room located within the pod is connected by a subtle staff passageway that allows nurses to move freely between the rooms without moving in and out of rooms and corridors. Instead, sliding doors, similar in concept as to what one might see moving between the cars of a train, provide a seamless path of travel for nurses to traverse through, providing more efficient care to the patients they are responsible for. This idea of connection also lends itself to greater visibility of the patients by the staff as they are able to care for patients in one room, while monitoring auditory, and at times, visual supervision of other patients in other rooms.



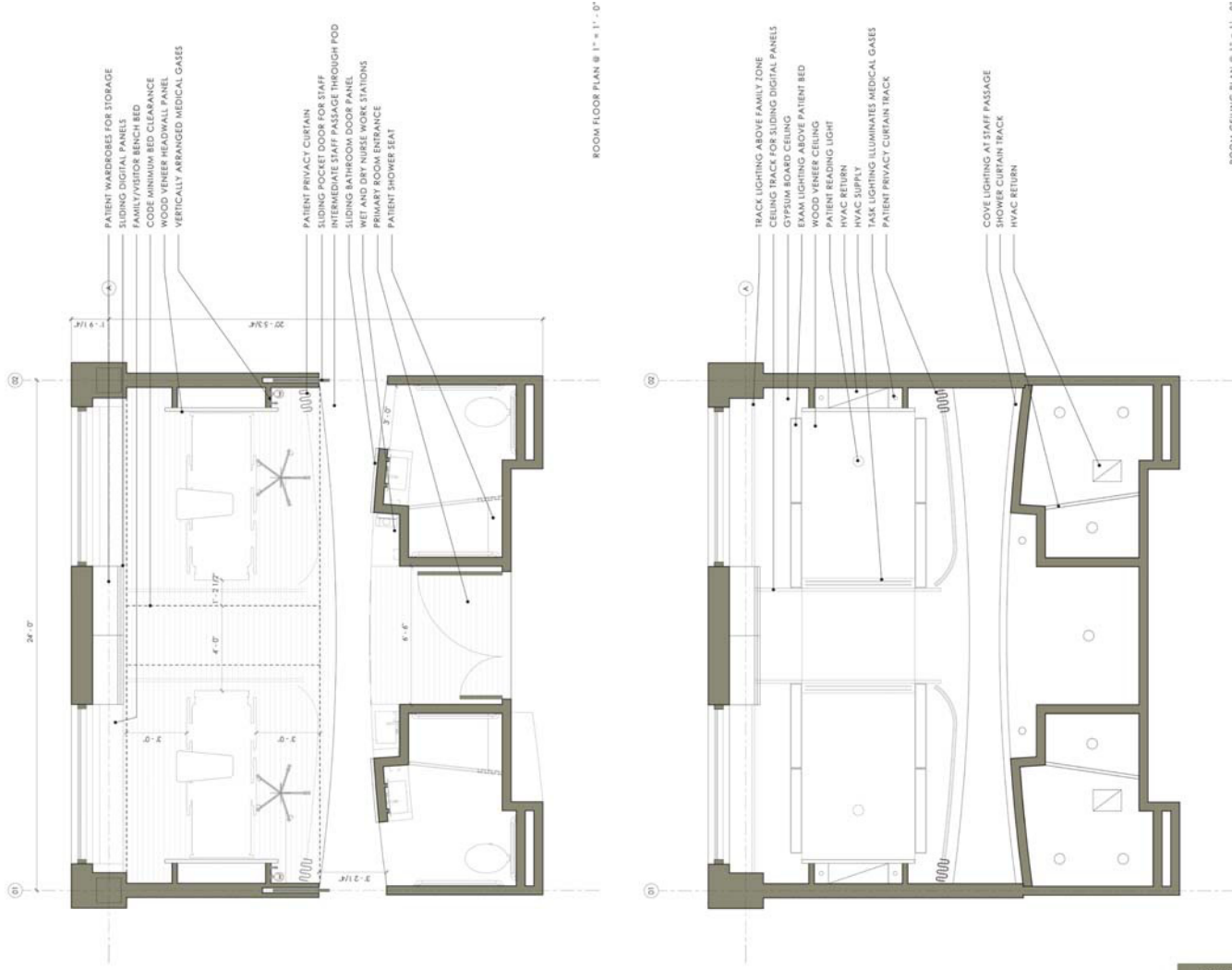
ORIGINAL MIISC UNIT TRAVEL DISTANCES	110 SF CENTRAL NURSE WORK PER 100 SF (INCLUDING STAIRS) OF UNIT	107 SF CENTRAL NURSE WORK PER 100 SF (INCLUDING STAIRS) OF UNIT	105 SF REDESIGN SUPPORT SPACES PER 100 SF (INCLUDING STAIRS) OF UNIT	111 SF REDESIGN SUPPORT SPACES PER 100 SF (INCLUDING STAIRS) OF UNIT	17,048 GROSS TOTAL S.F.
REDESIGN MIISC UNIT TRAVEL DISTANCES	90 SF CENTRAL NURSE WORK PER 100 SF (INCLUDING STAIRS) OF UNIT	81 SF CENTRAL NURSE WORK PER 100 SF (INCLUDING STAIRS) OF UNIT	101 SF REDESIGN SUPPORT SPACES PER 100 SF (INCLUDING STAIRS) OF UNIT	111 SF REDESIGN SUPPORT SPACES PER 100 SF (INCLUDING STAIRS) OF UNIT	15,712 GROSS TOTAL S.F.



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90. Presentation board seven: Design Analysis.

SEMI-PRIVATE ROOM REDESIGN : ARCHITECTURAL FLOOR PLAN AND CEILING PLAN



RAO DESIGN/ILLUSTRATION

91. Presentation board eight: Design Solution.

DESIGN SOLUTION : RENDERED ROOM SECTION - ELEVATIONS



92. Presentation board nine: Design Solution.

DESIGN SOLUTION : ROOM PERSPECTIVES



ROOM ENTRY PERSPECTIVE [01]

DESIGN SOLUTION The semi-private patient room redesign process began by evaluating the relationship of the patient beds to one another. Finding the optimal arrangement to be a mirrored condition, patient beds were placed directly opposite from each other locating patients on their own headwall. Mirroring the patient beds satisfied more design guidelines than any other arrangement as it put patients in an equal position relative to the rest of the room: both patients receive equal and direct access to views and natural light, neither patient is closer to the bathroom than the other, staff has equal visibility from the corridor to both patient beds, etc. Placing the patient beds on separate headwalls also provided an improved degree of privacy and personal space to each patient and their family. Acknowledging the fact that each patient and their family will at some point desire a greater level of privacy, flexible, sliding partitions were designed into the room that not only distinguish each patient's individual space within the room, but also serve as a "digital foot wall" giving both patients access to the television, internet, and additional hospital/patient information. The semi-private room redesign, incorporating many of the design elements favored in both private and semi-private room models, has the potential to contribute to the economic and environmental sustainability of contemporary healthcare design.



PATIENT PERSPECTIVE [02] WITH PANELS COLLAPSED



STAFF PERSPECTIVE [03]



VISITOR PERSPECTIVE [04] FROM BENCH BED



04 2 DESIGNATION

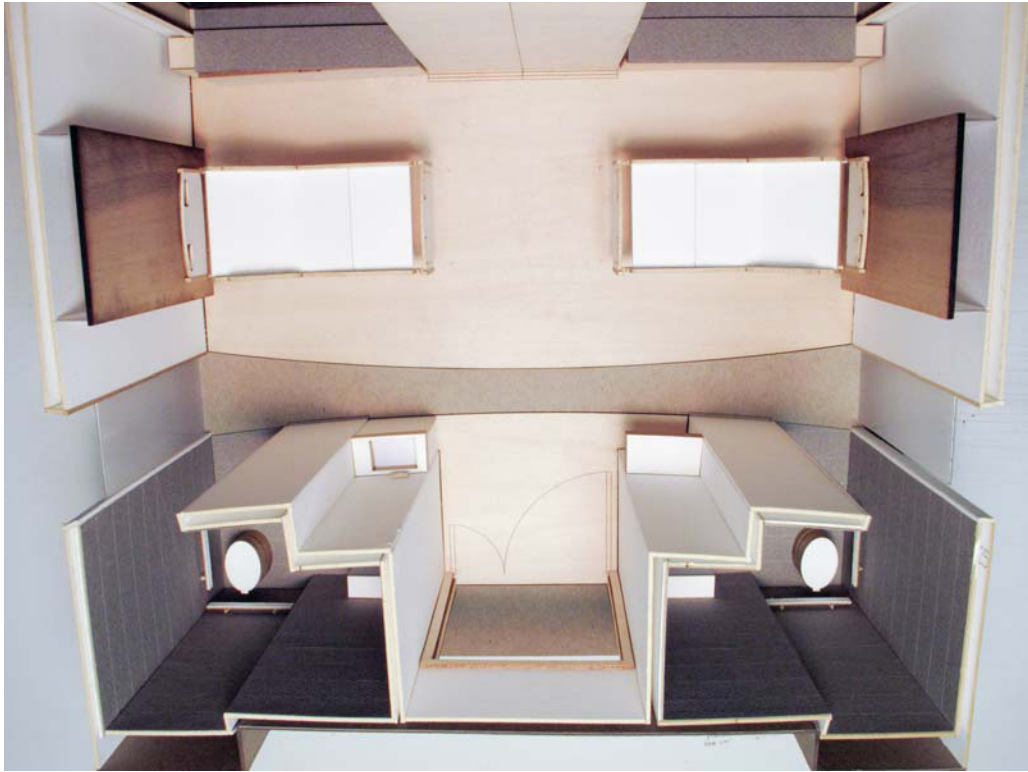
93. Presentation board ten: Design Solution.



94-96. Model photographs from room entry.



97-99. Model photographs of different perspectives in the room.



100-102. Room axonometric model photographs.

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42. Personal image.

43. *Is 'semi-private' always an oxymoron?*, Burnette, 3.

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45. Personal image.

46. Photograph courtesy of Derk Jan deVries.

47. Personal image.

48. *Innovations in Hospital Architecture*, Verderber, 226.

49. Personal image.

50. *Healthcare Spaces 4*, Yee, 234.

51. Personal image.

52. Personal photography, Medical University of South Carolina, Charleston, South Carolina.

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