Master's Thesis at Chalmers University
Architecture and Urban Design Programme
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Michael Apple

A Handbook on Facility Follow-Up

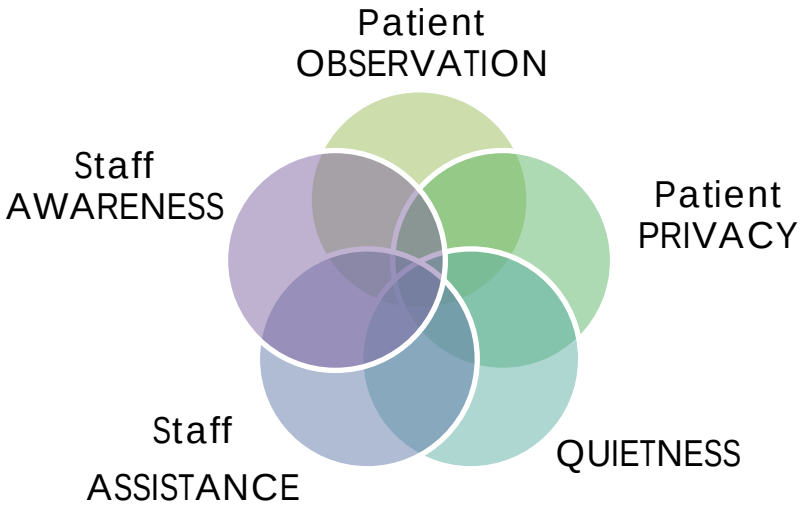
&

Examples of its Application in Evaluating Intensive Care Patient Rooms

LEARN

From our buildings,

For our buildings.



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Please feel free to contact me if you have any questions or comments regarding this report: apple.mike@gmail.com

Overall Thesis Abstract

Part 1 of this thesis is a Handbook describing why design projects should be evaluated after buildings are in-use, and outlining a process for how designers, planners, and managers can learn useful information from following-up projects. Methods such as "post-occupancy evaluation" are often recognised by practitioners but rarely utilised. This Handbook presents the topic of facility follow-up in a more clear and accessible way.

Part 2 of this thesis is an example of evaluation. Hospital patient rooms in three local intensive care units are reviewed to learn how the design of the environment affects patients, their families, and healthcare staff.

Abstract:

A Comparative Study of Intensive Care Patient Rooms

The physical design of healthcare spaces has a tangible impact on patients, their families, and staff. Therefore, it is important that design decisions be made based upon research and proven experience in order to create a truly health-promoting environment. In intensive care, there is high demand for newly built units due to increases in patient volume and due to the challenge of performing modern care in older buildings. Further, in many countries, intensive care is in the midst of a significant transition from multi-bed patient rooms to single-bed patient rooms.

In order to provide valuable knowledge to these critical design decisions, this study reviews and learns from several recently built intensive care units in Sweden, investigating how the design of the environment impacts the well-being of patients, their families, and staff. The area of focus is the patient room "module", usually consisting of a pair of patient rooms and a joint location for monitoring and documentation. Three intensive care units completed since 2010 were reviewed. Methods included plan drawing analysis, staff questionnaires (n=72), staff interviews (n=9), and systematic observation (6 hours).

Observations and staff comments suggest that family involvement is higher in single-bed rooms, however a suboptimal room size or proportion may reduce family involvement. Many staff thought it was not possible to have private conversations in double-bed rooms. In some patient rooms, access to daylight and/or outdoor views was excellent, while other rooms were hindered by the use of frosted glass or the close proximity of adjacent bushes or buildings. The layouts of the patient room modules portray a dilemma between having efficient patient observation and ease of staff assistance, versus a calm and quiet environment with open family visitation.

In adapting from double-bed rooms to single-bed rooms, staffing models and design strategies must work in tandem to achieve a solution where staff can be effective and feel satisfied. The patient room module must be designed to allow an optimal balance of privacy, visibility, quietness, and staff access to assistance. A design that allows a high level of visibility from the patient room to the corridor may reduce staff feelings of isolation. An environment that allows flexible locations for charting, monitoring, observation, and conversation may be able to support variances in staff personality, patient acuity, and changing models of care.

PART 1

A Handbook on Facility Follow-Up

LEARN

From our buildings.

For our buildings.

“Reed warbler feeding a Common Cuckoo chick in a nest. Brood parasitism.” Photographer Per Harold Olsen. [1]

“Most architects are like cuckoos, that lay their eggs in the nests of other species and don't come back to see what hatches.”

- Christos Floros [2]

What would cause one to go back?

Responsibility?

Curiosity?

Love?

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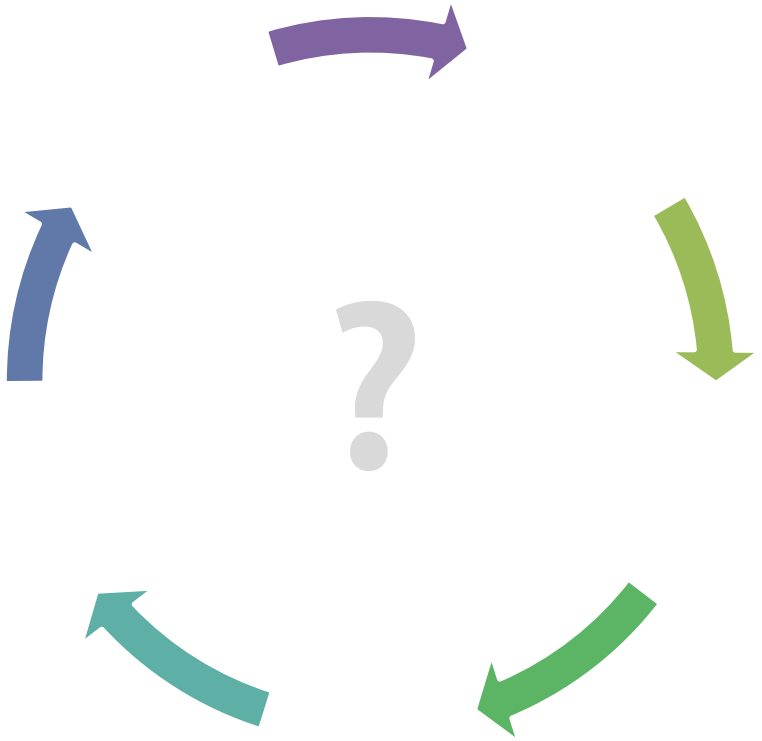


Regarding the photo on the previous page: cuckoo birds normally leave their eggs in another nest, and the other bird ends up taking care of the cuckoo's chicks. For a more objective discussion about architects not re-visiting their projects, refer to Way and Bordass, 2005.[3]

A carrot cake.
Photographer David Benbennick.[4]

Imagine.

Imagine making a cake - trying a new recipe. You put in a lot of time and care and now you are eager to taste the results.

How did it turn out?

Mmmm…that is delicious. I will have to make it again!

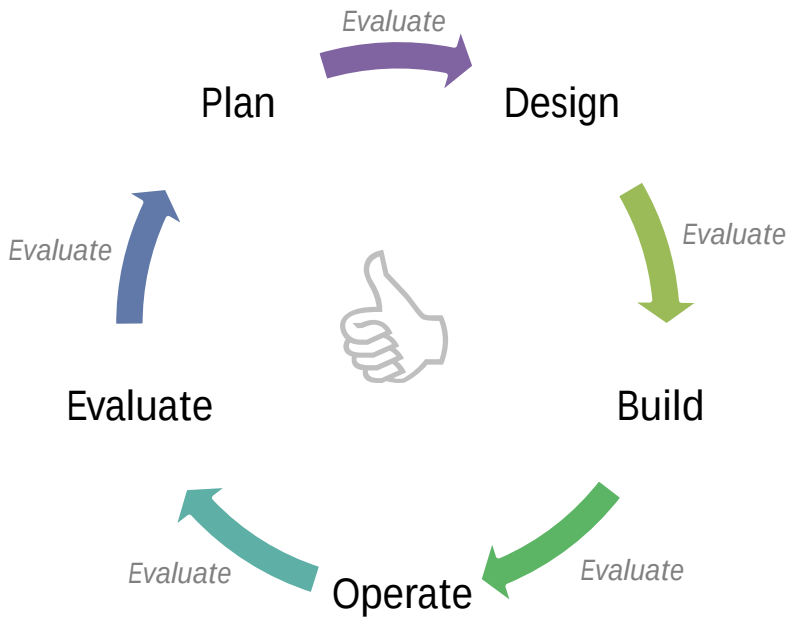
Hmmm…that's pretty good but something is not quite right…I'll have to make some adjustments next time.

Well...that didn't turn out so well…I guess I won't be using that recipe again!

Introduction

This handbook is intended to be a simple guide informing about the benefits and methods of following-up building projects after they are completed. Many types of practitioners, including architects, planners, and managers, can benefit significantly from learning the results of completed projects.

Whether baking a cake or designing a new building, evaluating the results is a natural next step in the process.



What is evaluation? What is follow-up?

In this context, to evaluate and follow-up mean to learn from something that has been done in order to inform what will be done next - to inform decisions. Every designer uses some kind of evidence in making decisions during a project.[5] Types of "evidence" can include personal experience, industry regulations, research studies, and much more. One important piece of this evidence base is learning from the results of finished projects - both of one's own projects and the projects of others. The information learned can serve as "feedback" to the facility evaluated or "feed-forward" to other facilities.

Evaluation can be done during any part of a project. For example, a room function program can be evaluated for adequacy, a design strategy can be evaluated for functionality or compliance with regulations, and a construction process can be evaluated for use of resources or polluting effects.

This handbook focuses primarily on the process of following-up a project after the building is constructed and in use by its occupants. However, many of the methods and processes described in this handbook can also be used in other phases of a design project or even in non-building projects.

Why is evaluation valuable?

In professional circles, many people are aware of the concepts of follow-up, post-occupancy evaluation, facility performance assessment, etc. However, many practitioners are not aware of the importance of this type of information, or do not grasp how to perform an evaluation in an effective way. As a result, evaluation historically has been a predominantly academic field.[6,7] Evaluation studies are not commonly performed,[3,6,8,9] and those that have been performed are often not shared in a useful way.[7,10] Therefore, there is significant potential to participate in building up this important knowledge base.

Many practitioners are familiar with project reviews and case studies published in trade journals and magazines. These formats are relatively easy to access and to understand, and as such provide inspiration for many people. However, it is possible that a design may be highly discussed and even widely replicated without any objective evaluation of its validity or impact. There are certainly cases where projects receive acclaim in the media but are inappropriate for or disliked by their users. [11]

In contrast, a facility evaluation has a different approach – to investigate project results in a rigorous manner and in real-life conditions, in order to provide results that are objective, meaningful, and can be used with confidence.

The benefits of building evaluation are numerous, for a variety of situations and a variety of different client and project types.

Examples of what can be learned in an evaluation:

Short-term

- ✓ To inform decisions during programming and design
- ✓ To realize and resolve minor functional and operational issues in a building, improving performance and/or reducing cost
- ✓ To confirm whether design goals and intentions were achieved

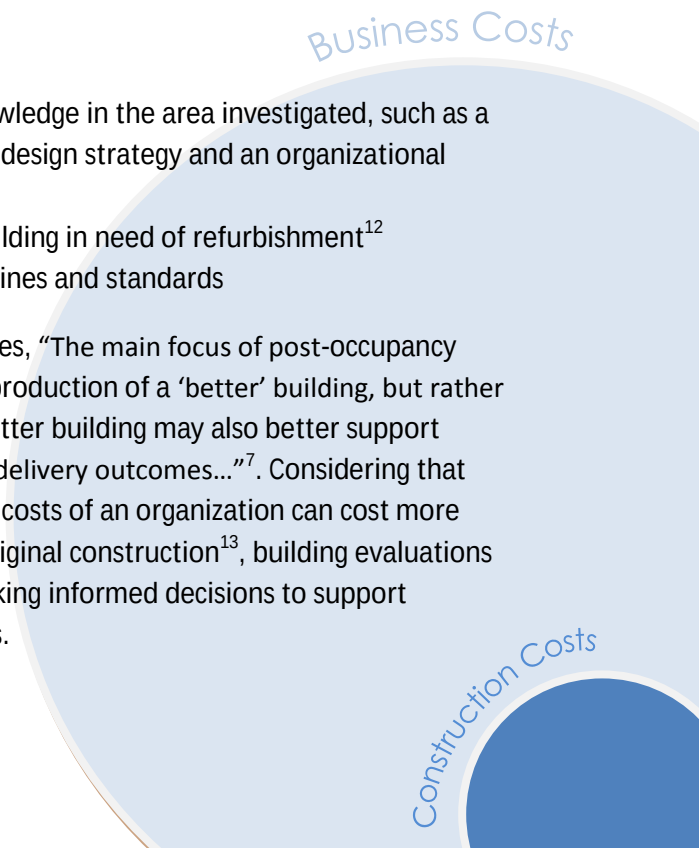
Medium-term

- ✓ Confirmation of successful or unsuccessful design strategies to determine reuse in other projects.

Long-term

- ✓ Generation of new knowledge in the area investigated, such as a relationship between a design strategy and an organizational outcome
- ✓ To realize areas of a building in need of refurbishment[12]
- ✓ To inform design guidelines and standards

As researcher Jane Carthey states, "The main focus of post-occupancy evaluation is not solely on the production of a 'better' building, but rather also on the realization that a better building may also better support improved service (or business) delivery outcomes…"[7]. Considering that staffing and business operating costs of an organization can cost more than 10 times the cost of the original construction[13], building evaluations serve as important tools in making informed decisions to support optimization of these outcomes.



What to evaluate?

The first step in doing an evaluation is to determine goals, objectives, and purposes:

- ✓ *What kind of things do you want to find out?*
- ✓ *What do you want to do with the information you learn?*

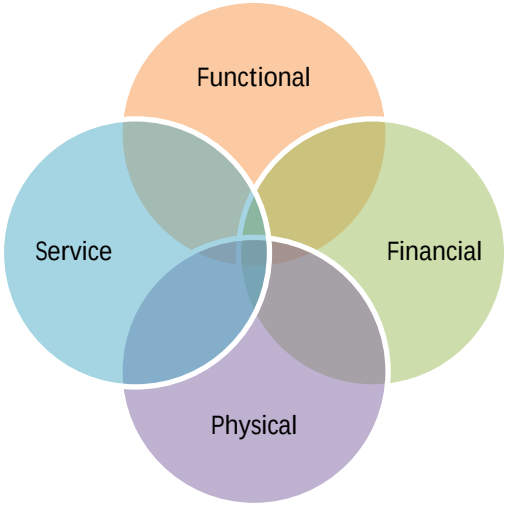
The benefits and outcomes listed on the previous page give a good starting point to work from. While determining the main objectives of the evaluation, at the same time consider which types of items should be evaluated. The possibilities are endless, but priorities and focus must be chosen in order to yield meaningful results in a feasible timeframe.[7,14]

In a groundbreaking book on evaluation in 1988, Preiser *et. al.*[15] suggest evaluating performance in the following categories:

- Technical elements such as fire safety, ventilation, structure, roofs, lighting, acoustics, etc.
- Functional elements such as adequacy of space, ergonomics, flexibility, security, circulation, etc.
- Behavioural elements such as privacy, social interaction, user experience, orientation, etc.

Other categories are possible also, such as evaluating the process of project delivery, the value of a building to a historical and cultural context, the use of materials and resources, or financial outcomes.

Each project and each organization has specific interests and purposes. In one example, a healthcare organization in Canada created a standardized evaluation methodology for use on multiple projects.[16] A key objective was to see how a facility affects organizational goals in a comprehensive way. A four-pronged approach was developed based on a Balanced Scorecard.[17]



- ✓ Physical – "Our buildings incorporate innovative design and construction practices."
- ✓ Service – "Our buildings provide high quality service environments."
- ✓ Functional – "Our buildings provide high quality work environments."
- ✓ Financial – "Our buildings make wise use of human, financial, and material resources."

In addition to this Building Performance Scorecard created by Steinke, Webster, & Fontaine, 2010, their report also provides a summary of standardized evaluation tools available today.[16]

Planning the study

After beginning to determine objectives and focuses of evaluation, it is time to begin developing a plan for how to accomplish the evaluation.

The process of creating a study plan includes determining:

- ✓ Which building(s) to evaluate
- ✓ Which item(s) to evaluate
- ✓ Type of study design, framework
- ✓ Resources required (e.g. people, instruments, approval for the study, etc.)
- ✓ Data collection method(s) to use (e.g. survey, interview, etc.)
- ✓ A strategy for implementing the data collection methods
- ✓ A strategy for analysing and utilising the results

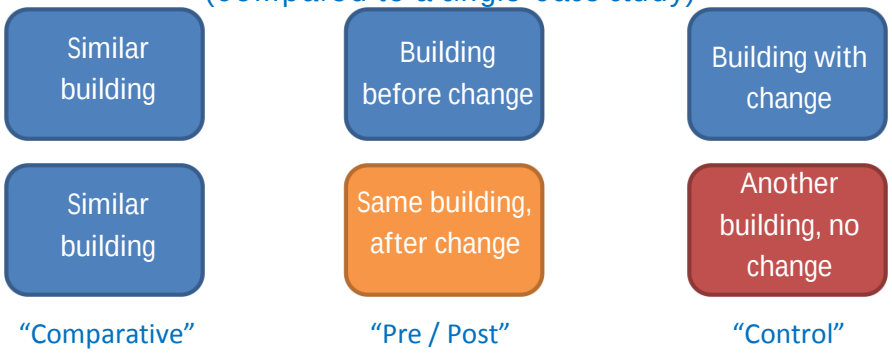
Researcher Jacqueline Vischer comments, "The importance of the *process* used in carrying out a post-occupancy evaluation cannot be underestimated…it is more important than the method selected and the data gathered."[8]

In most cases, the process is planned in the beginning, and then established goals are used to guide the entire evaluation study, rather than goals being developed or changed *during* the study.

There are many different ways to set up the framework of an evaluation study. One option is doing a quick and simple evaluation of a single facility. Alternatively, if several facilities use similar design strategies, an evaluation study could be performed on them together as a comparison. For a study at a new facility, the evaluation could also be performed at an existing facility as a "control" to see if there are different results at the new facility. Third, data could be collected at an existing facility and again at the new facility, to compare and look for changes due to a new design.

Various Ways to Increase Rigor

(compared to a single-case study)



Planning the study should include an understanding of what confounding variables may occur, and how they can be controlled if possible. For example, in evaluating the quality of daylight and views in a building, variables could include the weather, building orientation, use of blinds on the windows, the features of the outdoor environment, and other factors. Understanding the variables and factors affecting an evaluation item will assist in choosing appropriate methods of evaluation and in achieving useful information as a result.

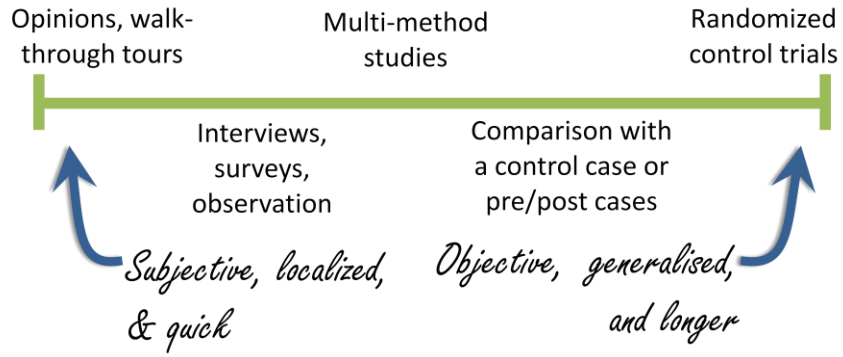
It is also important to be aware of the difference in evaluating subjective items or objective items. In a research laboratory, a satisfactory degree of objectivity can be obtained. In a living and active building setting, people and the environment are constantly changing, and confounding variables are more possible. In order for an evaluation study to result in useful information it is helpful to plan ahead.

The spectrum of design rigor

The concept of evaluation is certainly not unique to the field of architecture and building. Actually, the field of design research commonly borrows methods and study designs from other fields, such as environmental psychology. For example, questionnaires and interviews are used in many disciplines.

Within all fields, there is a rough spectrum and hierarchy to the rigor of a study. There is no "perfect place" on the spectrum, but rather in each project situation the study plan must be devised in an appropriate way to meet the stated study objectives.

The spectrum below is adapted from hierarchies of evidence by Hamilton[18], Evans[19], and the Center for Health Design.[14]



Study designs toward the right side of the scale are generally more research-like: objective, systematic, based upon tested methods, and with significant control of variables. These types of studies may take several months (or years) to implement, and will often result in very specific information that could then be applicable to other settings. An evaluation study with a higher level of rigor may be able to show strong and convincing relationships between design strategies and certain outcomes.

Study designs toward the left end of the scale are much simpler to accomplish in terms of time and resources. These types of evaluation studies can be useful to learn information about a specific setting or to determine general design outcomes and responses.

In theory, an evaluation study could range from a 10 minute follow-up call to a building user, all the way to a multi-year research study by a team of people. The study design framework should be planned according to the desired outcomes and the available resources.

Choosing data collection methods

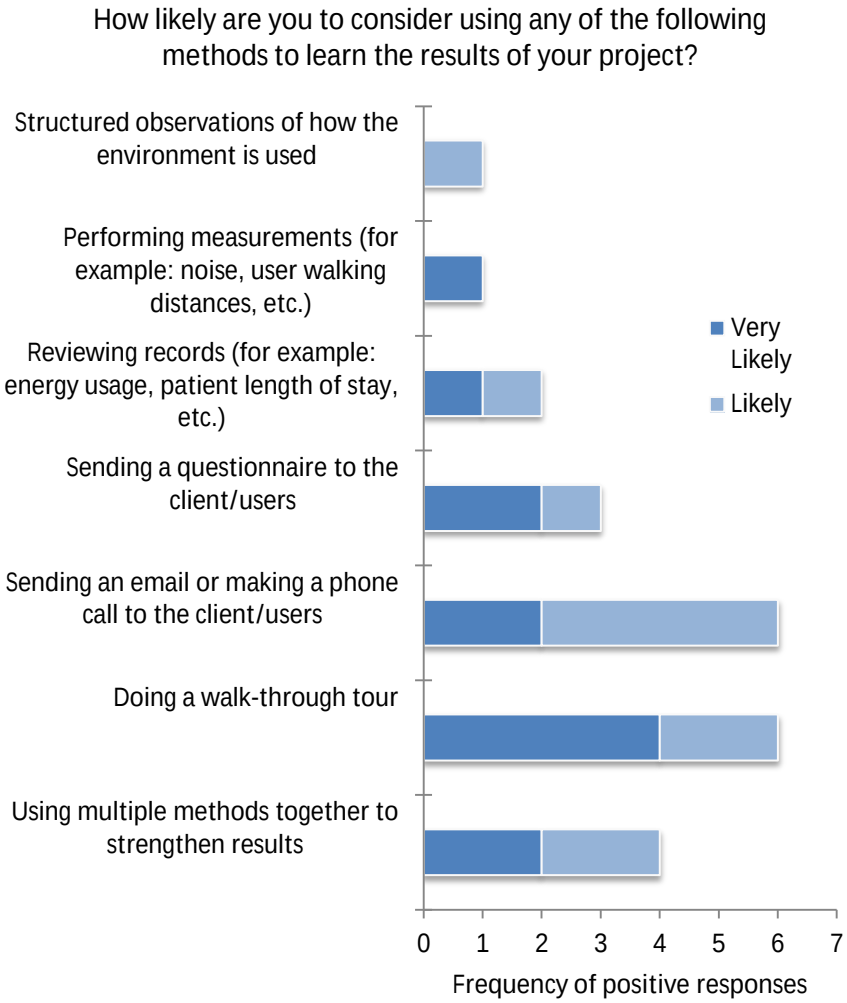
There are countless ways of collecting data during an evaluation study. Different methods have varying requirements in terms of required expertise, amount of time needed, or the type of data the method results in. Having clear study goals and objectives, as well as having well-defined items to evaluate, can assist in choosing appropriate data collection methods. For example, evaluating a "functional" item may be done by interviews or observations, while evaluating a "technical" item may be done better by recording measurements.

In general, using multiple methods together helps to strengthen results. It can also be helpful to use qualitative and quantitative methods together.[7] The data collected from one method can be compared with the data collected from another method, so that the results are more supported.

Planners, designers, and managers have different levels of willingness to use different methods, often based on comfort level and experience, but also based on required time and cost. The author performed a short survey of practitioners in the U.S. and Sweden and the results show, not surprisingly, which methods people are more comfortable using. (figure)

Data collection methods can be grouped into several categories, and combining together methods from different categories can strengthen results.

- Self-reporting – when people report their own opinions, such as interviews or questionnaires
- Observations - when elements or behaviors in the environment are observed and recorded
- Measurements/records – when data is measured objectively, such as acoustics, walking distances, or recorded data



A toolkit of data collection methods

The following pages give an overview of some commonly used data collection methods. Carefully planning how the methods will be used can help to ascertain useful results.

Self-reporting methods

Questionnaires

Surveys/questionnaires are a useful way to generate a response from a large group of people. Questionnaires can have a variety of question styles, including rating scales, multiple choice, or open-ended questions. If a suitable pre-made questionnaire to use cannot be found, it can take considerable time to make a new questionnaire of high quality. It is useful to follow-up questionnaires with interviews or focus groups to learn a greater depth and learn "why" certain responses were given.

Interviews

Interviews may be structured with a pre-determined list of questions, or may be unstructured. Interviews are often recorded and later transcribed so the content can be analyzed thoroughly. In some occasions interviews are done via telephone. Even questions sent to a person in an email are an abbreviated form of structured interview.

Focus groups

This type of group interview/discussion is helpful way to find out a group consensus on a matter, and hearing the thought process along the way can also be quite valuable. Sessions can be structured or semi-structured.

Open-input wall

This method involves utilizing a chalkboard, whiteboard, or a blank poster to solicit open and free comments from users. Appropriate prompts are key to getting quality responses.

Observational methods

Observing physical traces

This method involves observing evidence ("traces") of things in the environment that signify a certain behavior or activity is occurring, or that an element is not functioning as intended. Things to look for can include informal signs posted, broken or worn items, empty or over-full storage areas, etc. Observation can be made in-person, by video or photograph.

Behavioral mapping

This method involves recording the behaviors that occur in a place, often including both type and location of activity. Changes over time can be recorded. Behavioral mapping can be done in-person, by video recording, or by time-lapse photography.

Example diagram created as a result of a "mapping" session, showing movement of people and types of interaction:

Participatory observation
This method involves becoming an actual "participant" in the setting where the study is taking place. For example, when evaluating an office, a person could work in the office for some time, in order to get firsthand experience with the environment, to better understand users of the environment, and to have better access to user comments.

Measurements

Records
This method involves utilizing records that are recorded by the client organization, often inherently as part of business operations. Example records can be maintenance request reports, energy usage, etc.

Drawing analysis
Drawings of the building can be reviewed systematically for areas of interest, such as room sizes or walking distances between certain spaces.

Instrument recording
Instruments can be used to record a variety of items, for example noise levels, lighting levels, or user walking distances.

Variations

Walk-through tour
A walk-through tour through the building can be a helpful way to get an overview and introduction to the setting and to major issues. A tour is actually a combination of an interview + observations. Walk-through tours can be structured or open-ended, and along the way specific questions can be asked about areas of focus. Walk-through tours are sometimes recorded for later analysis.

Participatory activities
Design games, interactive workshops, and other participatory activities are a variation on other methods such as the interview and focus group. However in this case the method is much more exploratory and can often result in creating new information as well in as evaluating previous information.

Common hindrances

As stated earlier, facility evaluation has not been a widely practiced activity. Many academic authors have analyzed and lamented the lack of evaluations performed or made available, while also identifying several key barriers preventing wider implementation:

- Lack of available time[8,20]
- Concern for potential liability and/or negative findings of one's own work[6,14]
- Lack of skill and ability to perform an evaluation[8,14,20]
- Lack evaluation teaching in educational curricula[6,9]
- A desire to protect one's own knowlege[8]
- View of evaluation as too complicated, difficult to have useful results, and/or not worth the effort[7,20]
- Projects can take a long time between design and final occupancy, and by then design teams have often disbanded and moved on[7]

And the foremost reason:

- Performing evaluation often requires additional finances and/or it is not clear who is responsible for the cost[3,6–9,14,20]

In response to the predominant hindrance of cost, evaluation experts Way and Bordass give an example financial situation for a basic type of facility evaluation:

> "The cost is not high: the only true net increase is for visiting after handover, and undertaking any surveys. For the architect, this represents less than 0.25% of construction cost on a full-scope appointment. However, this cost should be balanced against the net gains of less rework and snagging revisits for the design and building team, together with the commercial advantage of the intelligence gathered for future use, and the likelihood of better client references." (Way & Bordass, 2005)[3]

In response to these challenges, the following section describe several example evaluations of varying rigor, and the concluding section outlines several ways in which everyday practitioners can cross the threshold to begin evaluating projects.

Example Evaluations

Several actual facility assessments are described below to give examples of various processes, methods, and results.

- A building development and management company in Stockholm routinely performs a basic evaluation after each project is completed. The evaluation is mainly a one-time meeting, involving a multi-disciplinary team of people involved in the project. The team reviews a list of important criteria to determine what is working well and what is not, and identifying issues needing resolution.

- A team of researchers and designers in New Mexico, USA evaluated four senior citizen community centers. A plan drawing review was done at each facility, as well as a questionnaire to staff and users (community residents). One-half day was spent at each facility, for a walk-through tour and interviews. The results of the study were used to inform a design program for new senior community centers.[15]

- A research team evaluated a new type of building to determine its usefulness – a freestanding inpatient center for AIDS patients. The team performed interviews, questionnaires, and behavioral mapping observations. The results were useful to show that the new type of building was effective and could be emulated in future designs.[21]

- A collaborative team of researchers, designers, and facility staff conducted a study at a hospital. Data was collected before and after the new building was completed. Daylight was measured by instruments in certain patient rooms, and facility data (patient records, staff vacancy, etc.) was compared to determine if spaces with more daylight had better outcomes.[22]

Many other example evaluations can be found by searching online, and a more thorough list can be found in the book *Healthcare Facility Evaluation for Design Practitioners by Mardelle Shepley.*[23]

Making it happen

In order to increase understanding and ability of designers, planners, and managers in the realm of building evaluation, this Handbook has pared down and made accessible the most important and fundamental elements of evaluation.

In addition, other people are striving to increase accessibility, for example by encouraging collaboration with research firms and academic institutions.[23,24] Doing so increases skill and ability levels, while also opening up new mechanisms of financing.

Another proposal is a program called Soft Landings[3] in which members of the design team stay involved with the project during the transition to the client's ownership and operation – to prevent a poor hand-off, low functionality, poor commissioning – a "hard landing". In some cases members of the design and construction team can stay in the client's building for up to a year.

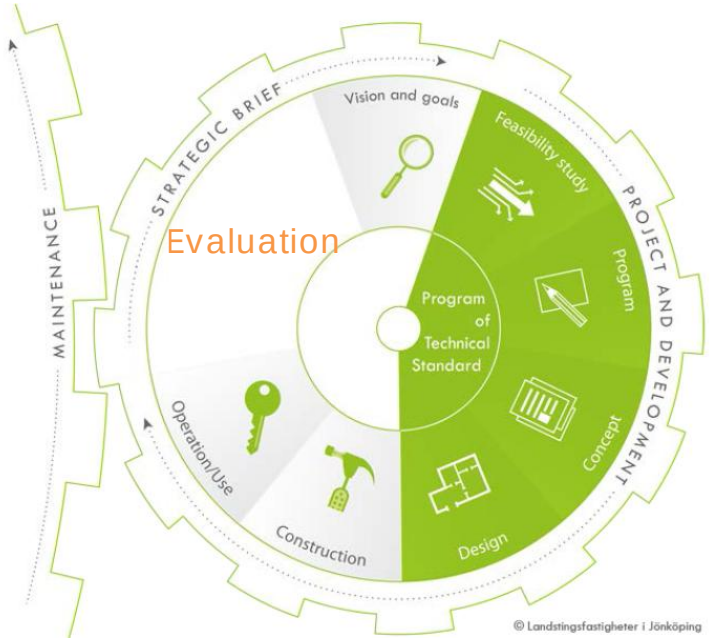
A common suggestion is the use of standardized approaches to evaluation. While a standardized approach may not be possible for all projects or all situations, in general a standardized method for a specific design firm or a client organization can be quite successful and efficient.[8,23] Public clients and large organizations with many repeat projects can especially benefit from this[20], and potentially reap financial and performance enhancements as a result of facility evaluation.

The field of evaluation could also potentially benefit from "lowering the bar" to some degree; or rather, widening the range of discussed rigor. In some situations, and especially for practitioners unfamiliar with evaluation, a basic assessment could be performed with a simple phone call or email to a client or building user to follow-up performance and learn some results of the project. A very basic and subjective evaluation is likely better than none at all, and it is potentially a stepping-stone toward further levels of rigor. It is proposed then that those practitioners not yet in the habit of evaluating projects begin in a simple way – a short phone interview with a client, or maybe a walk-through tour of the finished building.

In fact, many designers are familiar with and interested in walk-through tours. As part of many projects, walk-through tours of comparable projects are performed as references and precedents. However, it is less often that a designer or planner tours his or her own work. This could just as well be added to his or her repertoire – a type of tour that could have quite a different significance in impact.

Finally, it is proposed that practitioners build upon already well-established programs.

In Sweden, one of these is the Program for Technical Standard, PTS. This design programming tool is used for healthcare projects in much of Sweden. The tool is well developed in providing technical standards, room program requirements, and evidence-based design information. However, the system is lacking in evaluation capability[25] - as shown in the diagram below, a key part of the wheel is ready to be filled in with "evaluation". Without this, the continuous feedback loop is not truly continuous. This gives a ripe opportunity for many large healthcare clients to work together, sharing the results of facility evaluations, to improve the PTS database in an effective way.



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Another of these programs is ISO 9001. Many design firms already have established implementation programs of ISO 9001 for continuous improvement. ISO 9001 is used effectively throughout the world to improve the quality of a product, reduce mistakes, increase on-time delivery, and ensure meeting the customer's objectives. In design firms, the quality evaluation is most often performed on the project process and the deliverables to the client, such as providing quality and timely documents. While this is valuable, the potential is much greater.

ISO 9001 is most known for its use by manufacturing firms, who usually deliver products that can be objectively and quantitatively evaluated. This "product" can be evaluated and tested for quality while still in the possession of the creating firm. In a design firm, the "product" is actually two aspects: one is the documents and deliverables, which are checked for quality before giving to the "end-user" (client). The second product is the building itself, which is rarely a part of the quality process at all, and often is extremely difficult to evaluate or test for quality. A design firm could "test" for quality via digital simulations and building mock-ups, or based on previous experience that the building "product" is of high quality – i.e. previous facility evaluations.

For design firms, there is an additional mediator between their "product" and the "end-user" –the construction firm. This aspect adds complexity to the process of reviewing the quality of the building product. If a building product fails or is of low quality, it may be hard to detect since the product is of a subjective nature, because there are intermediate parties, and unclear roles and responsibilities. The inclusion of facility evaluation studies can help to create a more streamlined and continuous quality improvement process for design firms.

This Handbook has given an overview of how designers, planners, and managers can effectively follow-up finished building projects.

The Handbook has described what evaluation is and why it is important. A variety of different study framework options were presented, along with a spectrum of rigor to be used uniquely for each project. Further, a toolkit of data collection methods was presented to allow practitioners to select as needed.

There are several existing programs and practices in place which an facilitate the incorporation and extension of facility follow-up and evaluation. Design firms and clients have significant opportunities for improving building performance, reducing operating costs, and for being more in touch with the everyday users of their buildings.

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Note: images and diagrams were created by the author unless noted otherwise.

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A Comparative Study of Intensive Care Patient Rooms

EXECUTIVE SUMMARY

Michael Apple

January 2013

CHALMERS

To read a full version of this report, or to make any comments or questions, please contact: apple.mike@gmail.com

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Figure 1 - Double-bed ICU patient room in southern Sweden which opened in 2011 [1]

Introduction & Objectives

In many places around the world, such as in Sweden, there is a high demand for new intensive care beds. [2–4] Further, in many countries, intensive care is in the midst of a transition from multi-bed patient rooms to single-bed patient rooms. This difference in building design has a dramatic and significant effect on nearly all aspects of intensive care: initial construction costs, long-term unit operating costs, and most importantly, the well-being of patients, their families, and healthcare staff.

This study aims to provide valuable knowledge that can inform future decisions made regarding intensive care unit (ICU) design. The study reviews and learns from three recently built intensive care units in Sweden, investigating how the design of the environment impacts patients, their families, and staff. The area of focus is the patient room "module" – usually consisting of a pair of patient rooms and a joint location for monitoring and documentation.

The study objectives contain both short-term and long-term goals:

- To realise how the ICU physical environment is being utilised, and to realise staff perceptions of the environment, so that unit managers can make minor adjustments in operations and/or physical environment.

- To provide knowledge on how recent ICU design strategies are performing, in order to inform future designs.

Affecting Outcomes in Intensive Care

Many research studies now show a clear connection between the built environment and specific effects on people and organisations.[5] These outcomes can include for example patient pain, patient length of stay, nurse satisfaction, and unit profitability. Due to the great importance of these outcomes it is imperative that design decisions be made based upon credible information and with clear goals and outcomes in mind.[6]

In the intensive care unit, the fundamental outcomes are first to save the life of the patient, and second to assist the patient in recovering to a quality of life similar to what he/she had before entering the ICU. There are a myriad of sub-factors affecting the achievement of these aims, such as staffing, medication, the patient's condition, and the physical environment of care. This study investigates the role of the physical environment on several selected topics of focus that are relevant to current ICU design:

Patient well-being – the care environment should support the patient's physical comfort, sense of awareness, improve sleep, and reduce stress. Positively contributing factors include quiet rooms, appropriate lighting, daylight, nature views, social support, and more.

Family involvement – having family members present with the patient can enhance patient well-being and improve communication with staff.[7]

Staff efficiency and well-being – the design of a unit can significantly affect staff collaboration, effectiveness of patient observation, the number of staff required for each patient, and overall staff satisfaction.

The Context of Evaluation

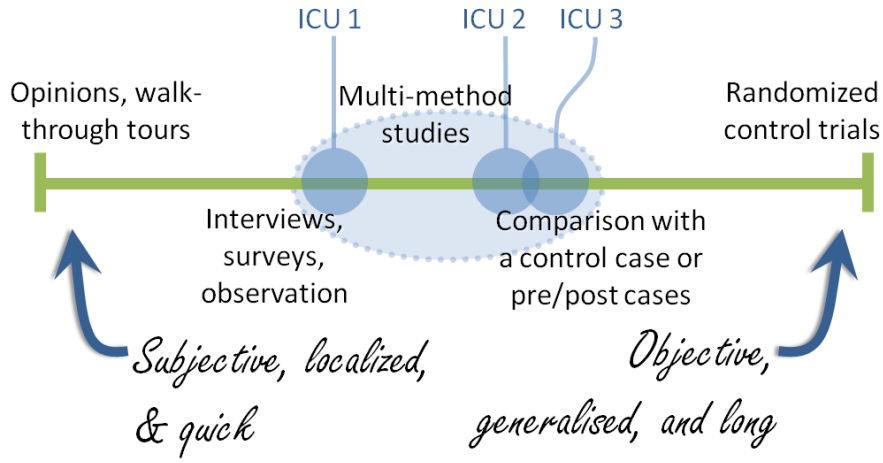
Systematically assessing a building after it has begun to be used by its occupants is a valuable way of determining "real-life" performance and effects of the design, and confirming design strategies to use (or not use) on future projects. Though in general these types of evaluations are not commonly performed[8–11], many evaluations have been done throughout the past several decades. Several evaluations have reviewed intensive care environments:

- A study by Smith[12] used observations and questionnaires to evaluate the staff conditions and patient care in pediatric ICUs in a children's hospital, as preparation for the design of a new hospital.
- A study by Wang and Kou[13] used a walk-through tour and focus groups to evaluate the applicability of design guidelines for negative pressure isolation rooms.
- A study by Shepley et al.[14] reviewed ICU hospital records and measured daylight levels, to determine the relationship between daylight to patient pain and daylight to staff absenteeism.

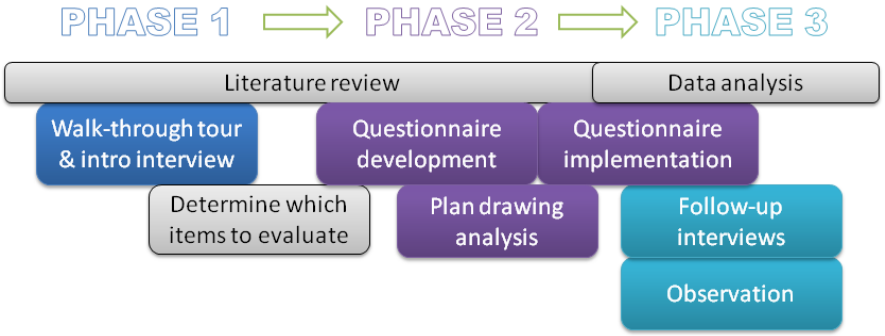
This design of this ICU evaluation study was informed by the process, methodology, and results of previous "facility performance assessments" and "post-occupancy evaluations". In addition to the two objectives previously stated, this study also aims to explore and test evaluation methodology as applied in a Swedish context, and serve as an example and inspiration for future evaluations.

This study was designed as a comparative evaluation, reviewing and learning from the results of several ICUs. This approach allowed a variety of design typologies to be investigated, and also for different design strategies to be compared together. The study also used multiple methods of data collection to allow results to be tested and confirmed. The author's university department and each of the ICU departments approved the study.

The participants of the study included nurses, assistant nurses, and doctors. Patients and family members were not directly involved, due to the amount of time and resources allocated for the study. This study uses multiple methods and a systematically planned approach in an attempt to provide a useful and objective outlook. However, the study is generally investigative and qualitative in nature, and does not intend to serve as scientific research on design/health outcomes. Considering the whole spectrum of design research, this study lies somewhere in the middle of the scale:



Study Methodology & Process



Phase one of the study included a literature review of intensive care design and of evaluation methodology. An interactive walk-through tour and an interview of a unit manager was conducted at each of the ICUs.

Phase two involved plan drawing analysis and the development of a questionnaire. Plan analysis involved evaluating room sizes, relationships, and potential visibility provided. Questionnaire items included demographic information, 4-point Likert scales, and open-ended responses. One week was given to complete the questionnaire, and response rates ranged from 14% - 42%.

Phase three was conducted at ICU 2 and ICU 3, and involved follow-up interviews with staff, as well as observations of the use of the environment. At both ICUs, the observations involved the author recording on a plan drawing the flow of people in the patient room module and the types of interactions that occurred. Observation was performed in sessions of 15-30 minutes, for a total of 6 hours.

The resulting data was a mix of qualitative and quantitative items, which together proved to be useful in corroborating results.

Descriptions of the Three ICUs

The ICU patient rooms at ICU 1 and ICU 3 were completely renovated. At ICU 2, the existing single-bed patient rooms received cosmetic upgrades, and two new double-bed patient rooms were added in a new building expansion.

The table below outlines the basic data of the three units. Information from the ICUs at UMC Utrecht (Netherlands) and at NKS (Nya Karolinska Solna, Sweden) are shown as reference examples.

Unit	Project Finish	ICU Beds	Single Bed Pat. Rooms	Single Room Area (m²)	Double Bed Pat. Places	Double Place Area (m²)
ICU 1	2010-03	6	2	27	4	23
ICU 2	2012-02	9	5	21	4	23
ICU 3	2010-09	14	12	31	2	33
Utrecht	2010	36	36	23	0	-
NKS	2016	69	69	25	0	-

As of the year 2012, ICU 3 contains the highest proportion of single-bed rooms in Sweden. A large sliding door connecting two patient rooms together causes the design to be a type of “hybrid” between a single-bed and double-bed room. The one “true” double-bed room is most commonly used for post-op patients.

Each unit features a patient room module consisting of similar components: the patient room, a place for monitoring, observation, and documentation, and a place for disinfecting medical supplies and disposing of waste. The design of a patient room module can vary significantly in terms of layout, number of rooms, and number of patients.

Results

Patient well-being

Most patient rooms were designed with a “clean” appearance on the walls and ceiling, with occasional accent colours. Staff areas generally had a more welcoming ambience with softer lighting, more colour, and natural materials. At ICU 3 in particular staff made comments that the room appeared “sterile” and “impersonal”.

Figure 2 - ICU 2, staff break room with decorative lighting, wood furniture, and accent colours

Figure 3 - ICU 3, showing the decor of the room, artificial lighting, and the window view of shrubbery

The quality of exterior views varied significantly. Some windows had frosted glass hindering the view (ICU 3), while other views were predominantly of bushes (ICU 3) or a building (ICU 1). Staff expressed a dislike for these “views” and implied that patient well-being could be hindered. In the double-bed rooms at ICU 2 the window view and daylight was excellent. Some staff expressed concerns of reduced patient privacy (potential for people outside to look in).

In all units, the operable windows were used often. At ICU 3, the patient room exterior doors were highly appreciated but were rarely opened, and it was even more rare to take a patient outside.

Staff at all units stated that single-bed rooms were better for the patient, for example in terms of privacy, family involvement, and reduced noise and disturbances. Some staff stated concerns regarding light entering the patient room at night, either via the adjacent patient space or via the documentation/monitoring room.

Figure 4 - ICU 2, showing the large window with a full view of the outdoor environment

Family involvement

The results of the observations and interviews did not fully agree with the questionnaire results. Observations noted higher levels of family involvement in ICU 3 (hybrid single rooms) than in ICU 2 (double rooms and smaller single rooms).Interview comments stated that single-bed rooms were beneficial for improved privacy, less disturbances, and greater ability for family to stay in the room during care activities. However, the questionnaire results on average show that staff at all units were similarly satisfied with how well the room supports family involvement.

Significant factors supporting or hindering family involvement include room size, room amenities (e.g. coat hook or designated family chairs), unit amenities (i.e. family rooms), unit visitation policy, and staff attitudes toward family involvement. Units with double-bed rooms often had policies limiting two visitors per patient, while in ICU 3 with single-bed rooms there was no limitation. In general staff viewed single-bed rooms as providing an environment more supportive of family involvement.

Patient room module layout and impacts on staff

When observing and monitoring patients, staff preferred to be in the patient room rather than the adjacent documentation room. The documentation room was useful for accessing patient records and/or for having conversations with other staff members. In ICU 3, staff expressed a desire to be able to hear what was happening in the patient room (in addition to the excellent visibility of the patient room from the documentation room). In ICU 2, the doors between the documentation workroom and the patient rooms were usually held open. This created an efficient workflow for staff, and ability to hear what was happening in the patient room, but also caused more noise in the patient room. In each unit, documentation could also be done on a computer in the patient room.

In ICU 3 the sliding door between patient rooms was most often left open halfway. Staff often passed through the doorway, met in the middle to interact, or remained in the middle of the doorway to have efficient observation and access to each room. The door was closed when needed, for example in case of a procedure, in times of extensive family involvement, or with a terminally ill patient.

Figure 5 - ICU 3, from left: room entry door, documentation room window, and sliding door connecting two patient rooms

The double-bed rooms at ICU 2 and the single-bed rooms at ICU 3 had a similar staffing ratio of 1 nurse and 1 assistant nurse for every two patients. The defining factor in allowing this similarity was the effect of the sliding door, which caused the single-bed rooms to function like a double-bed room in terms of patient observation. However, ICU 3 was said to require more staff circulating in the corridor to provide general assistance.

The questionnaire results, interviews, and observations were in agreement that double-bed rooms are more supportive of effective visibility of patients and of staff collaboration. The resulting effects are significant: single-bed rooms at ICU 1 are not used often due to the extra staffing needed; single-bed rooms at ICU 2 are used for lower acuity patients; the rooms at ICU 3 with no sliding doors (isolation rooms) are used less often due to the extra staffing needed.

At ICU 3 (with hybrid single-bed rooms), staff shared varying opinions regarding the module design. Some staff described their feelings with words like “isolated” and “alone” while others used words like “calm” and “focused”. Some staff stated that they did not feel able to effectively observe/care for two patients without utilizing the sliding door. Strong responses were given regarding the difficulty in accessing assistance from other staff.

Discussion and Reflections

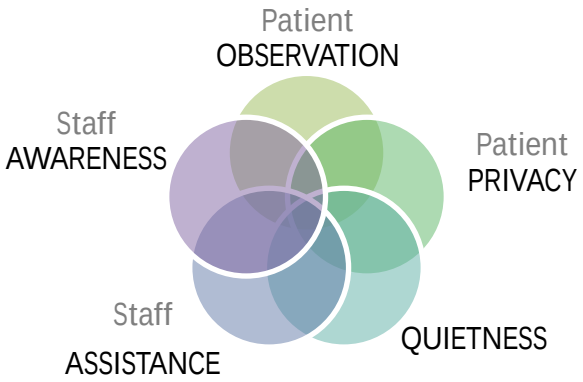
The traditional Swedish model of intensive care involves close staff presence at the patient bedside, an ability to observe multiple patients at once, and a staff awareness of where colleagues are and what they are doing. These qualities are naturally present in a double-bed room layout, but difficult to achieve in a single-bed room environment. There are two predominant responses: adjusting the culture/model-of-care or utilising a greater number of staff per patient. The latter case was the viewpoint of the units studied, resulting in a preference to utilise double-bed patient rooms when possible (in order to reduce staffing costs).

This study suggests that single-bed rooms provide enhanced privacy for patients and families, reduced disturbances of patient sleep, and a greater ability for families to be in the patient room. The hybrid single-bed room at ICU 3 is an innovative way of attempting to maintain the qualities of a

double-bed room and gaining the benefits of a single-bed room. The presence of a sliding door between rooms supports efficient staff observation and collaboration. It is not clear if the environment still achieves single-room benefits such as reduced medical errors, reduced patient stress, and reduced spread of infection.

The design of ICU 3 retains traditional model-of-care aspects such as observing multiple patients at once and preferring to be in the patient room rather than looking through an observation window. Nevertheless, staff at ICU 3 still experienced challenges in adapting to a new environment, and even two years later some staff feel isolated and find difficulty in accessing assistance.

The design of the patient room module layout effects several interdependent factors (Figure below). Ideally, all of these factors will be achieved. This is difficult however. For example, a design enhancing staff awareness, assistance, and observation can easily detract from quietness and patient privacy.



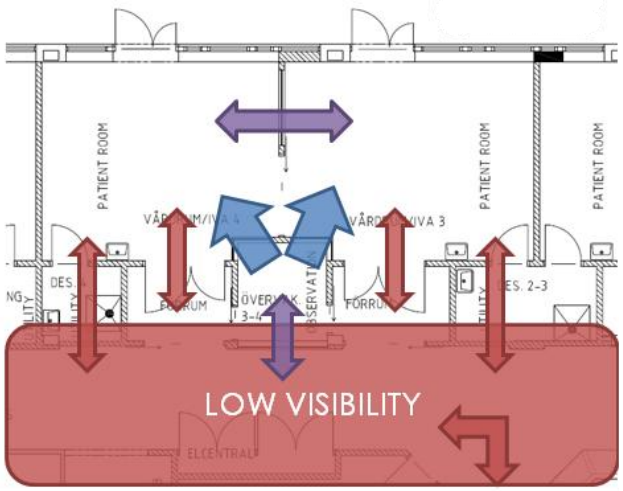
All ICUs in this study featured a high level of visibility from the documentation room to the patient room, and from one patient room to another. However, the utilisation of the documentation room varied, as staff usually preferred to be in the patient room. Further study is recommended to investigate the affect of a non-enclosed documentation area on these interdependent factors (such as at Utrecht ICU).

In most units, there was a low level of visibility from the module to the corridor. In ICU 3 with 2-3 staff per module, the low visibility may have contributed to staff members feeling alone, not aware of their colleagues, and having challenges in getting assistance. In ICU 1 and ICU 2 with 4-6 staff members working together in a module, these concerns were much less significant.

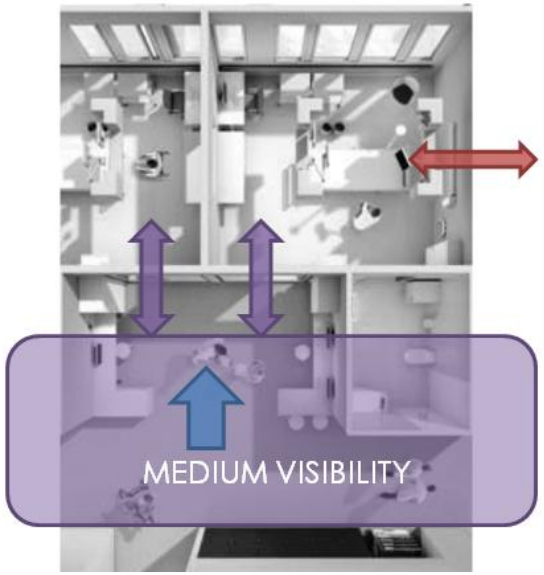
In attempts to achieve these interdependent factors in single-bed rooms, patient room module designs feature varying levels of transparency. At ICU 3, high visibility within the patient room module creates an effective workflow, but low visibility to the corridor creates staff feelings of isolation.

In comparison at the NKS ICU, the design of low to medium visibility within the module requires more staff, and may create feelings of staff isolation. At Utrecht ICU, high levels of visibility (glass walls) and the grouping of patient rooms across the corridor allow the number of staff to be reduced and may allow staff to be aware of their surrounding environment. Patient privacy is controlled by glass walls that can change from clear to frosted. Out of these three examples, patient privacy from the corridor may be best in ICU 3, where there is low visibility.

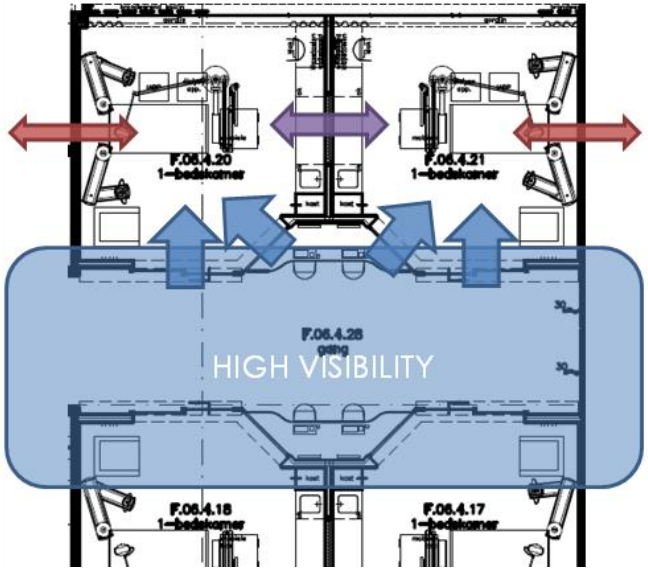
Figure 6 - Comparison of the transparency of three patient room modules. Transparency is measured based upon the presence of windows and doors.
Diagrams by the author, with plan underlays from White arkitekter Göteborg[15]; NKS/White[16]; and Valtos Architects.[17]



ICU 3 - 2 staff per 2 patients
Low visibility: module to the corridor
High visibility: between patient rooms
High visibility: documentation rm. to patient rm.



NKS ICU – 2-3 staff per 2 patients
Medium visibility: module to corridor
Low visibility: between patient rooms
Medium visibility: documentation area to patient rm.



Utrecht ICU – 2-3 staff per 4 patients
High visibility: module to corridor
Medium visibility: between patient rooms
High visibility: documentation area to patient room

In conclusion, adapting from double-bed rooms to single-bed rooms requires staffing models and design strategies to work in tandem to achieve a solution where staff can be effective and feel satisfied. The patient room module must be designed to allow an optimal balance of privacy, visibility, quietness, and staff access to assistance. A design that allows a high level of visibility from the patient room to the corridor may reduce staff feelings of isolation. An environment that allows flexible locations for charting, monitoring, observation, and conversation may be able to support variances in staff personality, patient acuity, and changing models of care.

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Note: images and diagrams were created by the author unless noted otherwise.

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PART 2

A Comparative Study of Intensive Care Patient Rooms

FULL REPORT

A post-occupancy study evaluating the functional performance of three new Swedish ICUs

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1. Introduction

Around the world, many healthcare systems are in the midst of systematic changes such as increased or reduced privatization, altered models of reimbursement, shifts toward preventative care, and/or preparing for changing demographics. (Chan 2009; Preiser 2003) In the midst of these circumstances, many systems are struggling to survive financially. (Campbell 2012; Arup 2012) At the same time, the cost of facility construction and operation continues to escalate. As a result, it is more imperative than ever that healthcare facilities be designed for optimum performance – both in the short-term and long-term. To successfully achieve this task, design teams must make decisions thoughtfully, based upon a knowledge base combining proven experience with credible research.

The intensive care unit (ICU) is a key area since demand is growing (Bergsland 2010; Hope 2010; Snygg 2012), and since the ICU costs a disproportionately large and growing portion of healthcare costs (Knaus et al. 1993). Likely many countries, Sweden is in the process of renovating or replacing an ageing healthcare building stock. Several new intensive care units have been built in the last few years and serve as prime examples and prototypes, as many new intensive care units are built in the near future.

Nearly all projects face a dilemma between project wishes and available capital costs. However, in ICUs recently completed in Sweden another dilemma has also arisen: a discrepancy between what is considered the optimum design for patient recovery, and the funds available to operate the unit (to provide staffing). Even in some existing hospital wards there is a challenge to provide adequate staff due to funding, and ICU nurses in particular are in short demand. (Andree 2009)

Figure 1 - New ICU Patient Room in Kalmar (Ek 2012a)

In addition to evaluating organizational and care processes, it is crucial to investigate the relationship between the design of the unit and the staffing and healthcare outcomes. This report provides information regarding the performance of recently built intensive care unit designs in order to inform decisions made in subsequent designs.

During the last few years, the design of inpatient hospital spaces has been in transition from single-bed patient rooms to double-bed rooms. In many

countries, particularly the United States, this transition is nearly complete, at least for all newly built units. In Sweden, single-bed rooms have been incorporated in most new designs for regular inpatient wards, and the transition is in-progress now for intensive care wards. Of the last four intensive care units built in Sweden – in Kungälv, Trollhättan, Mölndal, and Kalmar – one featured predominantly single-bed rooms, while the others featured a combination of single and double-bed rooms.

The outcomes and implications regarding this change are enormous. The choice between a single patient room or a double patient room can affect patient length of stay, number of nursing staff required, quantity of physical space required, and on and on. The present time appears to be a threshold towards a new paradigm in intensive care and provides a key opportunity to evaluate the reality of how new designs are functioning and bring to light key issues affecting design outcomes.

Figure 2 - Utrecht ICU in 1989 (University Medical Centre Utrecht 2011)

2. Study Objectives

The core concept of this study is to review, evaluate, experience, and learn from recently completed intensive care units in Sweden, focusing on the patient rooms. The specific objectives of the study were multi-faceted in order to reach a variety of audiences:

First, the study aims to realize the strengths and weaknesses of the designs utilized, in the scale of the whole unit and especially of the patient room.

Second, the study aims to see if the designs goals were achieved and if important design criteria were achieved. If the desired features are present in the unit design, then this project also aims to determine whether the features are functioning as intended.

Third, the study aims to investigate how the design affects several highlighted areas of current interest in this field. Hypotheses were developed to clearly articulate potential impacts of the designs.

Fourth, the study aims to explore and test methods of evaluating completed buildings in order to add to a young and growing knowledge base in Sweden.

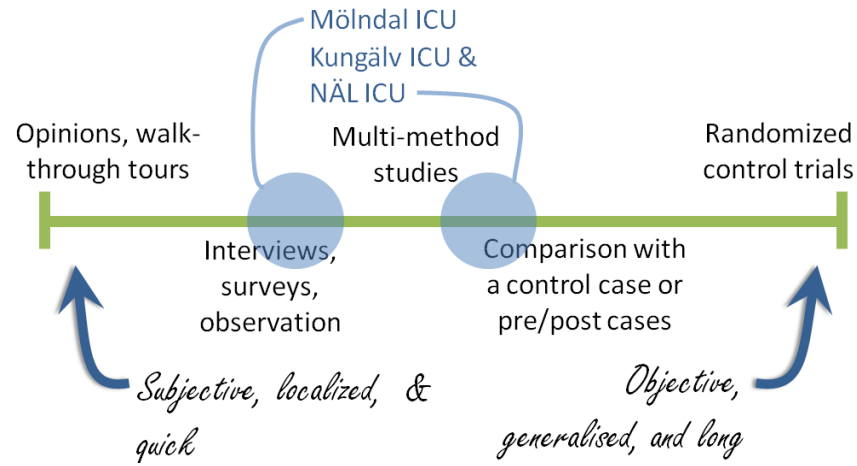
3. The Context of Building Evaluation

Facility performance evaluation, post-occupancy evaluation, and other types of assessment studies have proven to be helpful methods of learning useful information about the built environment. (Shepley 2011) The focus of studies can vary widely, covering aspects such as technical, functional, customer-service, and financial interests. (Friesen, Trojan, and Suter 2008) Methods and designs of studies can also vary widely, ranging from one-day walk-through based evaluations to long and highly structured experimental research studies. (Preiser, Rabinowitz, and White 1988) Using multiple methods of data collection can be used to add strength to the results. (Hamilton and Watkins 2009) Most experts recommend that evaluation occur 6-18 months after the building is occupied and in use, to allow for building users to be fully adapted to the new environment. (Harris et al. 2008)

This study primarily focuses on evaluating the functional aspects of the intensive care units, in particular investigating the effect of certain design features on staff, family, and patients. Secondarily this study contextually considers other factors such as technical, financial, and organizational issues.

Within the conceptual framework of building evaluation, this study lies in the middle portion of the spectrum of design research (see Figure 3). This study uses a planned and multi-method approach in order to increase usefulness and validity of the results. In addition, the results of multiple units are compared together. However, this study does not include measured quantitative data such as patient length of stay, nursing staff turnover, or acoustical measurements, which can be useful to compare with qualitative data.

Figure 3 - Location of the Study on a Spectrum of Design Rigor, adapted from hierarchies of evidence by (Hamilton 2012; Evans 2003; Harris et al. 2008; Shepley 2011)



In the last several decades, building evaluations have been performed for a variety of different building types. Healthcare is a particularly useful field due to the significant impact the built environment has on financial and health-related outcomes. However, evaluation studies are not routinely performed due to a several logistical challenges, particularly cost. Several evaluations have been performed of healthcare environments (Friesen, Trojan, and Suter 2008; Sherman et al. 2005; Wang et al. 2011), however few evaluation studies have been performed on intensive care units.

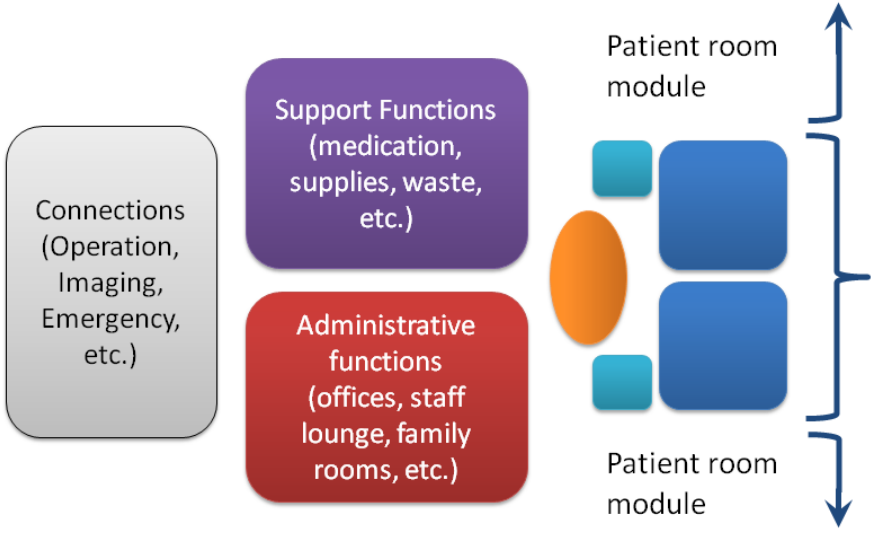
A study by Smith (2012) used observations and questionnaires to evaluate the staff conditions and patient care in a several pediatric ICUs in a children's hospital, as preparation for the design of a new hospital. A study by Wang and Kou (2009) used a walk-through tour and focus groups to evaluate the applicability of various design guidelines to the ICU setting in question. A study by Shepley et al. (2012) reviewed ICU hospital

records and measured daylight levels to determine the relationship between the environment to patient pain and staff absenteeism.

4. The Intensive Care Environment

The ICU is a place of intense collaboration striving to stabilize patients in a critical life or death situation. Once stabilized, a patient remains in the unit for a period of time under close observation until he/she is ready to be transferred to a unit of a lower acuity level. These situations and goals are the overarching themes in mind when designing layouts and spaces in an ICU.

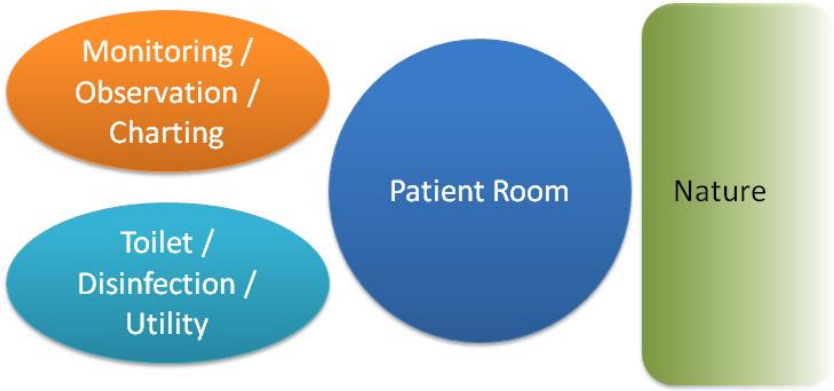
Figure 4- Overview of Functions in an ICU



The building spaces in the ICU often include patient rooms, monitoring rooms, family rooms, a place for staff respite, places for staff collaboration, and support spaces such as for equipment, supplies, and waste. Design features often included in a unit design are providing daylight, minimizing walking distances for staff, increasing staff visibility of patients, and having convenient connections to other departments such as Surgery and Imaging (radiology).

The patient room is a crucial feature of the unit design for several reasons: the room design is usually repeated many times in the unit; the patient remains in the room nearly all the time; the room is an ideal place for family presence; and the room is the location for most types of patient care and treatment. As a result, the patient room environment must be flexible in meeting diverse and dynamic requirements. Patient rooms are often grouped in repetitive modules that incorporate similar elements.

Figure 5 – Overview of Functions in a Patient Room Module



Many patients in the ICU are sedated and not fully alert, in order to reduce pain and to allow the body to recover. Other patients are alert enough to communicate, to eat, or to watch TV. Many patients are in-

between, and can communicate with difficulty by making sounds or squeezing a nurse's finger. Most ICU patients are not able to use the toilet; common options include using a bedpan or an indwelling bowel catheter. Most patients have equipment and wires attached to them to allow monitoring of vital signs such as heart rate and blood pressure, mechanical ventilation support for breathing, and receiving medication via IV. Equipment is usually located on either side of the patient's head on vertical columns or ceiling mounted pendants ("booms"). In a critical situation there may be 5-8 staff members present around the patient, necessitating the importance of a clear area to access the patient and to adjust equipment.

Traditionally ICUs have utilized paper records for patient information, but most units now use electronic records. Similarly, monitoring of patient vital signs is also done electronically via computer screens. As a result, this information can be reviewed from a variety of locations, including in the patient room or in a separate monitoring room, or nearly anywhere in the unit with a computer and data connection. When patient vital signs surpass a defined threshold then an alarm will sound so that staff are alerted and can respond quickly.

Swedish ICUs are generally served by the following types of staff:

- Physicians ("Läkare") – Doctors are responsible for making major decisions regarding care and for prescribing medication.
- ICU Nurses (IVA Sjuksköterskor) – Nurses are responsible for activities such as administering medication, monitoring, recording/charting patient information, and specialized care such as involving trachea-inserted ventilators (throat).
- Assistant Nurses (Undersköterskor) – Assistant nurses perform activities such as wound care, drawing blood, patient hygiene, and supply management.
- Some units also have physical therapists and other specialists present, either part-time or full-time, depending on the needs of the unit.
- Support staff work between many departments and are responsible for activities such as cleaning and delivering supplies.
- Family members also play a key role in the ICU, supporting the patient and communicating with staff.

5. Trends in Environmental Research and ICU Design

The field of environmental psychology has for decades discussed the impact that the built environment has on people's behavior. In recent years, these discussions and studies have also entered the realm of the architectural and healthcare practitioner. Many studies now show a clear connection between not only the built environment and human behavior, but also a connection between the environment and specific measurable outcomes of interest to practitioners. (R. Ulrich et al. 2008) These outcomes can include for example patient pain, patient length of stay, nurse satisfaction, and unit profitability. Therefore, due to the great importance of these outcomes, it is imperative that design decisions be made based upon credible information and with clear goals and outcomes in mind. (Hamilton and Watkins 2009)

In the intensive care unit, the fundamental aims are first to save the life of the patient, and second to assist the patient in recovering to a quality of life similar to before the patient entered the ICU. There are a myriad of

sub-factors affecting the achievement of these aims, such as staffing, medication, the patient's condition, and the physical environment of care. These two fundamental aims are quite broad in scope, and in order clarify implementation and measurement, practitioners often break down the aims into more specific goals based on various sub-factors.

Some goals in the ICU are focused on the processes and methods of care. For example, in some studies, the incorporation of a specialist ("intensivist") physician dedicated to patients' cases has resulted in better patient outcomes. As another example, reducing levels of patient sedation has often resulted in reduced patient delirium (confusion) and quicker and more complete recoveries. These types of goals are largely dependent on the patient's condition, the staff's expertise, medication used, etc. and to a lesser degree the physical environment. However, the impact of the physical environment certainly does play a role, for example developing new types of spaces for staff collaboration, or revising the ambience of a room environment to benefit patients that are more alert.

Other goals in the ICU are focused directly on the environment and spaces used for care, and even see the environment as a causal factor for certain outcomes. For example having low noise levels in a unit is dependent on the quantity of auditory sources, the type of sources, and to a large degree the physical environment. As another example, having high levels of family involvement in a unit is dependent on staff attitudes, unit policies, and also to a large degree on the space(s) provided for family use.

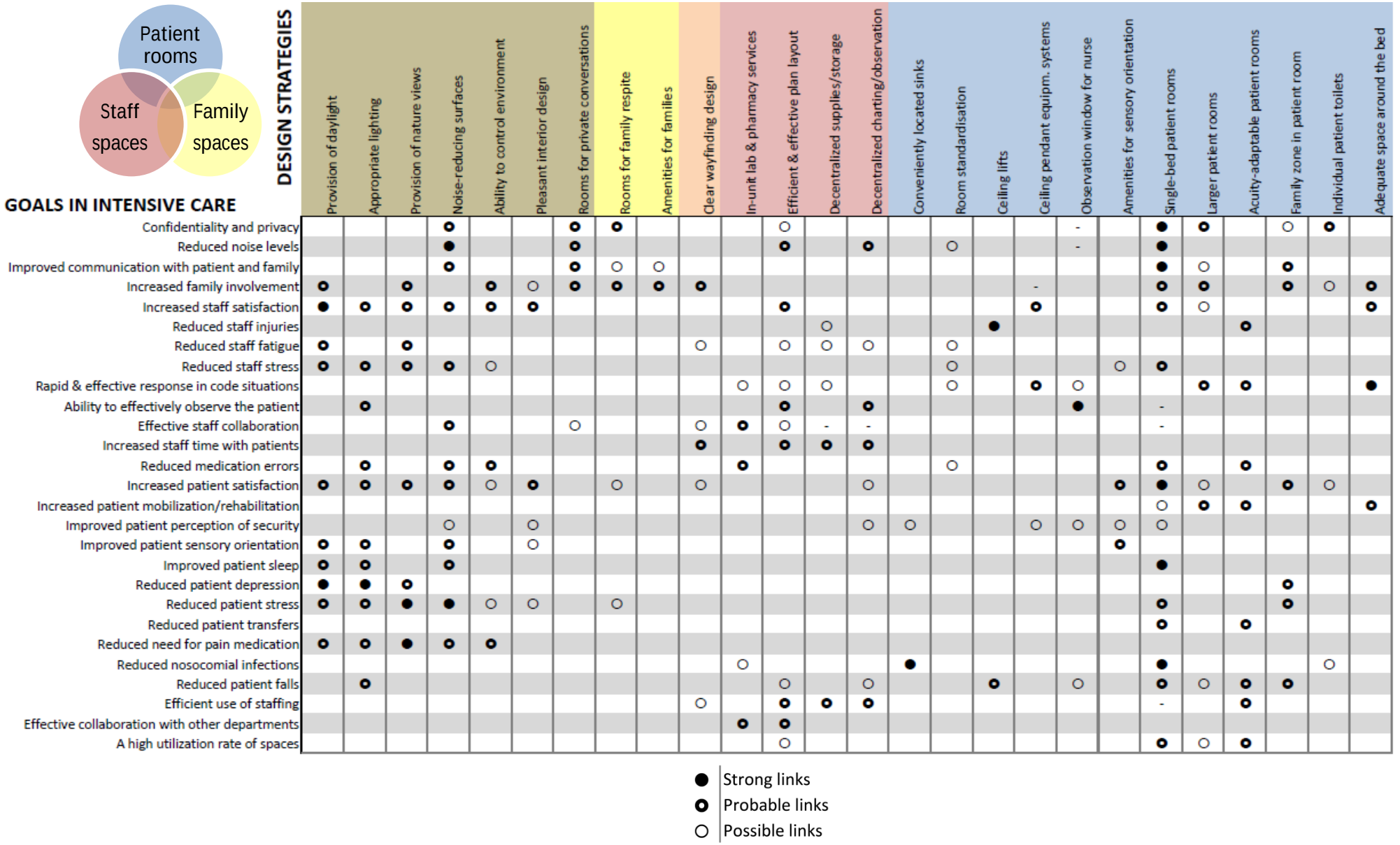
Nearly all goals regarding care in the ICU are affected to some degree by the design of the physical environment. The environment can either support or hinder the achieving of goals and desired outcomes in intensive care. The chart on the following page links together goals in intensive care together with various physical design strategies intended to support certain goals.

The link between design strategies and certain intensive care outcomes in some cases is quite clear and confident, and can even seem "common sense", such as the use of sound-absorbent ceiling panels to reduce noise levels. In other cases the relationship is less clear and less established, such as the relationship between standardized patient room layouts and staff satisfaction, staff fatigue, and medical errors. In most cases, a design strategy may affect several different outcomes, either positively or negatively.

In some cases, a design strategy may be a cause of an outcome that is not realized until further study in the future is accomplished. In each case, the achieving of intensive care goals and outcomes is affected by a variety of variables (including design strategies as a variable). It can be difficult to isolate a certain factor as the primary cause of an outcome. As a result it is important to understand the context and culture of a situation in order to make appropriate design decisions.

In summary, recent trends in intensive care include increased rehabilitation/mobilization, reduced sedation, testing for delirium, focus on improved patient sleep, and improved daylight and nature views. Research studies in each of these areas strongly suggest positive effects on patient outcomes.

Figure 6 - Links Between Design Strategies and Goals in the ICU, adapted from (R. Ulrich et al. 2008; Suarez 2008; Bergman 2011)



6. Highlighted Topics of Review

This study is an analysis of several different design strategies in a Swedish context. The following section provides an introduction to the key intensive care goals and topics reviewed in the study. Topics were selected based upon relation to original design goals and relevance to current practice.

Patient Monitoring and Observation

In an ideal situation, each patient would have a nurse directly at the bedside all the time, to provide personal, attentive, and responsive care. Staff would be able to observe changes in the patient's condition immediately, and respond quickly. However, such a situation is not logistically or financially possible. Traditionally, intensive care units tried to get close to this ideal by having many patients in one room, allowing a nurse to closely see and respond to patients. This "design strategy" of having many patients in a room is excellent for staff collaboration and patient observation, but had other outcomes that were more negative, some of which will be discussed in the section *Number of Patient Beds per Room*. Reducing the number of patients in each room has forced changes to be made to the way staff monitor patients.

Modern ICUs allow staff to monitor patients by a combination of physical presence (visual and auditory) and digital presence (monitors, cameras, etc.). In most cases when a patient condition changes and a staff response is needed, then physical presence is required. This encourages digital monitoring locations to be located in close proximity to the patient's location. In many cases, monitoring locations are designed to give staff visual contact with the patient, for example having a glass wall or large windows on the corridor side of the patient room. Often there is a dilemma on the balance between visibility and privacy.

Figure 7 - A monitoring and charting station between two patient rooms, at the 2011 international award winning ICU (University Medical Centre Utrecht 2011)

Staff Interaction and Collaboration

Intensive care is a place of making life-saving decisions in the midst of changing conditions. It is important for staff to collaborate together, asking for help and discussing care decisions. It is common that staff from various disciplines gather together to review a case. For new staff, it is important to interact from other staff to become familiar with the care environment and processes.

Many frequent care activities require the teamwork of multiple people. Simple tasks such as lifting a patient often require at least two people, and other tasks, especially in critical situations, may require a team of more than 5 people around the patient at one time. Since a patient's

condition can change suddenly, it is important that staff have the ability to contact others quickly for support and assistance. Contact can be made visually, verbally, or through an assistive device such as a phone.

Interaction between staff also affects psychological well-being. If a person is aware of where his or her team members are at a given time, the person will feel more secure about his or her work and that contact can be easily be made when needed. Further, positive interaction and collaboration fosters a team unity and camaraderie, which can affect staff satisfaction. Increased feelings of isolation or increased satisfaction can affect the quality of patient care as well as the rate of staff turnover.

Family Involvement

When patients are in a critical situation, having little control, and not feeling well, it can be comforting and encouraging to have family and friends present. In advocating unrestricted family visitation policies, the American Association of Critical Care Nurses has identified nearly 20 studies suggesting that patients are more satisfied, less anxious, and safer when family members are present. (AACCN 2011) Further, family presence "can improve communication, facilitate a better understanding of the patient,… and enhance staff satisfaction." (AACCN 2011)

Family and friends can be present in the room with the patient, in a family room within the unit, or in another area of the hospital. It is valuable to provide alternative options for families since at times they may wish to remain at the patient bedside, while at other times they may wish to go to other areas for resting, eating, etc. In some situations family members may need to temporarily leave the patient room if certain procedures are being performed. Family members who come from a long distance away may be more likely to visit if sleeping accommodations are provided.

The physical design of the unit and of the patient room, as well as the amenities provided for families and the attitudes of staff, can affect the quantity and quality of time that families have in visiting the ICU.

Figure 8 - Family Involvement in an ICU Patient Room (Emilsson 2012)

Patient Well-Being

Traditionally, many ICU patients have been fully sedated, and the affects of the environment on fully sedated patients are somewhat unclear. There are suggestions that factors such as noise and light do have an effect on patient outcomes, such as affecting length of stay. (Sessler, Grap, and Brophy 2001) Current best practice in intensive care utilizes less patient sedation than in previous decades, resulting in patients that are more alert and more affected by their physical environment.

Motivating factors for reducing sedation levels include reduced time spent in mechanical ventilation, reduced patient delirium and disorientation, and increased ability for in-unit rehabilitation. Each of these factors aims to improve patient recovery in both the short-term and long-term.

Patients that are under full sedation usually require less nursing attention than those who are more alert. For example, an alert patient may be able to communicate requests and needs, or an alert patient may try to remove monitoring equipment or mechanical ventilation tubes. As a result, it is important that nurses can monitor and respond to patients effectively.

Alert patients have some ability to try to grasp their condition and their environment. Patients may be able to interact with the environment, such as to watch TV, look through the window, or listen to relatives speaking. The design of the environment can assist the patient in realizing orientation of time, place, and awareness of normal life going on, which can be difficult to grasp in the midst of a severe illness and under the influence of strong medication. The design of the environment can also play a role in reducing patient stress by incorporating family, reducing noise, providing daylight, providing positive distractions, and by allowing some control over the environment.

Number of Patient Beds per Room

The number of patient beds per room affects a multitude of goals and outcomes, including all of those listed above. A single-bed room contains space for one patient and the associated staff and equipment necessary to care for the patient. Enough space for family presence is also usually available. Single-bed patient rooms may or may not have doors directly connecting with other patient rooms. A double-bed patient room is similar in features, but contains space for two patients. The patients can be separated by a low wall, a curtain, or a mobile screen (primarily to hinder visual contact).

Figure 9 – Single-bed patient room at Sahlgrenska Post-Op

The benefits of having a room with only one patient include: reduced healthcare-acquired infections, reduced medical errors, reduced patient falls, reduced patient transfers, improved staff-patient communication, improved privacy, increased presence of family, and reduced noise. (R. S. Ulrich 2011) A single-bed room allows the environment to be more personalized to a specific patient. Two single-bed rooms are often paired together to allow a single monitoring station overlooking the rooms.

The benefits of having a room with two patients include: improved staff visibility of other staff, improved staff visibility of patients, slightly reduced construction costs, and reduced numbers of staff per patient. A double-bed room allows staff to more easily care for two patients at one time. In Sweden two double-bed rooms are often paired together to allow one monitoring station to overlook four patient beds.

Although single-bed room units potentially require more space and more staff, some American studies suggest that single-bed units may be have similar or lower operating costs than double-bed room units, due to outcomes such as reductions in patient transfers, higher room occupancy rates, reduced medical errors, and reduced length of stay. (Chaudhury, Mahmood, and Valente 2004) However, the relationship between the design strategies and outcomes is difficult to ascertain, since there are many environmental and non-environmental variables affecting each outcome. Comparing northern European countries with higher proportions of double-bed rooms than the U.S., but similar or better healthcare outcomes, it is necessary to acknowledge the important role of human behavior and organizational culture as important variables. (Verderber and Todd 2011)

International Comparisons of Patient Room Types and Staffing

Like many countries, in Sweden recently built ICUs have a combination of single-bed and double-bed rooms. In any intensive care unit, at least some single-bed rooms (isolation rooms) must be provided to allow for the care of patients with contagious diseases. Trends in design in Sweden suggest that soon newly built units will feature solely single-bed rooms.

In many designs, patient rooms are paired together to share a common monitoring station and to allow efficient staffing. It is common for units to assign a ratio of a number of staff to a number of patients. This number will fluctuate based upon culture, staffing availability, and especially based upon patient acuity level. Patients who are more sick require more staff, and patients of lesser acuity require less staff. The number of staff assigned to each patient is a significant factor in the operating costs of the unit and of the closeness of observation provided.

The following paragraphs give brief generalized examples of design strategies and staffing ratios in various countries for a typical ICU patient case. (However, it is difficult to say "typical" since patient acuity levels and cultural models-of-care may differ in various countries)
The information sources are email communication with the author or online forum discussions with the author.

In Sweden, a common staffing ratio is 2:2, meaning one nurse and one assistant nurse are assigned for every two patients. This ratio is traditionally used in multi-bed rooms, and works effectively in allowing efficient patient observation and staff collaboration. The New Karolinska Hospital ICU in Solna (Stockholm) opening in 2016 will feature solely private rooms, and the staffing ratio is expected to be 3:2 (one ICU nurse and two assistant nurses for each two patients).

In the U.S. single-bed patient rooms are prevalent, and a common nurse staffing ratio is 1:2, meaning one nurse for every two patients. A ratio of 1:1 is used for very sick patients or in some specialized ICUs of higher acuity. At any moment a nurse may be in one patient room, or the adjacent patient room, or in the monitoring station in between. This situation creates a high dependency on monitoring alarms since at least one of the patients cannot always be directly seen/heard.

In the U.K. new projects can be a mix of single- and double-bed rooms. Single-bed rooms are sometimes considered to lessen the opportunity to visibly and audibly monitoring the patient. Staffing ratios in ICUs are often 1:1 and in Intermediate Care Units 1:2.

In the Netherlands, the recent award winning ICU in Utrecht features all single-bed rooms. The rooms feature glass walls in the corridor side to allow full visibility, yet the glass can be quickly turned opaque/translucent when privacy is needed. The staffing ratio is usually 1:1.5 during the day and 1:2 at night.

In Norway, most new and renovated ICUs are single-bed rooms. Some specialized units of higher patient acuity may plan for double-bed rooms, especially in renovation projects. The staffing ratio is approximately 2.5:2, and a common design strategy is to utilize decentralized charting stations between pairs of rooms.

7. Descriptions of the Evaluated Units

In Sweden in 2011 there were 84 intensive care units, including 18 specialized units (e.g. neuro, burns, infants). (SIR 2011) In the last three years, several new units have been constructed in Sweden. Three of these units are located in the region of Västra Götaland and are reviewed as the basis for this study. The following chart summarizes information about the four most recently completed units, as well as showing information for two comparison units.

NÄL ICU

Norra Älvsborgs länssjukhus (NÄL) is a regional hospital which opened in 1988 and currently has approximately 560 beds. It was decided that the intensive care unit at NÄL and at nearby Uddevalla hospital were each too small to operate efficiently, so the two units were made into one. It was a difficult process to merge together staff from different care processes and different environments, but the new way of working (i.e. single-bed rooms) unified them. The previous ICU at NÄL was a combination of one-, two-, and four-bed rooms, in the same location as the new unit is now.

Figure 10 - Summary of Basic Information on the Evaluated ICUs

Unit	Project Completion	Total ICU Beds	Single Bed Pat. Rooms	Area Single Room (m²)	Double Bed Pat. Places	Area Double Place (m²)	Healthcare Network	Region	In Unit With	Project Type
Kungälv	2012-02	9	5	21	4	23	None	V. Götaland	Post-op	Renovat. & Expansion
NÄL	2010-09	14	12	31	2*	33*	NU	V. Götaland	IMA	Renovation
Mölndal	2010-03	6	2**	27	4	23	Sahlgrenska	V. Götaland	Post-op	Renovation
Kalmar	2011-03				8			Kalmar	Post-op	
NKS Solna	2016	69	69	25	0	-		Stockholm	IMA, NICU	New
UMC Utrecht	2010	36	36	23	0	-		Netherlands	None	Expansion

**NÄL: This "double" room is most often used for 3 post-op beds rather than 2 ICU beds.*

***Mölndal: one room is used interchangeably as a patient room or a treatment room*

The new 14 bed ICU at NÄL opened in September 2010 and is the unit in Sweden with the highest proportion of single-bed rooms. The ICU and the Intermediate Care Unit are adjacent and share support spaces. Staff rotate on shifts between these two units and the Post-Op unit. Several of the 14 ICU beds are not occupied, making the unit prepared for future increases in patient volume.

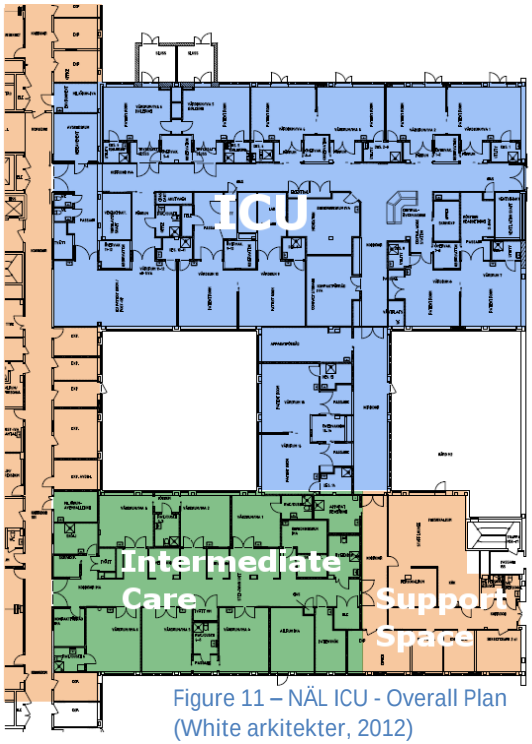


Figure 11 – NÄL ICU - Overall Plan (White arkitekter, 2012)

The unit is laid out with 12 beds along a primary corridor, and 2 beds on an adjacent secondary corridor. A central nurse station is located at the corridor intersection. A staff lounge is located at the end of the secondary corridor, adjacent to the Intermediate Care Unit. Family rooms for respite and sleeping (3 places) are located just outside the ICU (top left of plan).

The ICU patient rooms consist of a "module" or "pod" of paired single rooms and a shared monitoring room with windows into the patient rooms. There is a sliding door in between the two patient rooms providing a direct connection. With the sliding door open, the two patient rooms function similar to a double-bed room. With the door closed, each room functions like a single-bed room. In most cases each patient room module is assigned one nurse and one assistant nurse (ratio of 2:2). In cases of higher patient acuity or if a patient is on a ventilator, an assistant nurse may stay in the room all the time (and the ratio may be 3:2). Additionally, there are several nurses assigned to the "corridor", circulating in the department to help where needed. Although more staff per patient are needed compared to the previous unit, and the cost is higher, justification was made that this is the best way to perform healthcare and it is a better environment for the patients.

The patient rooms are relatively large in size compared to other units, with the smallest room being 30 square meters (323 ft²), not including the disinfection room. The room module is laid out with the patient beds back to back (mirrored), so that from the monitoring room a nurse can see the face of both patients. The patient can look to one direction and see the monitoring room, and look the other direction to look out the window.

Ceiling mounted pendant systems allow for equipment to be placed precisely beside each side of the patient. A hand-washing sink is provided directly upon entering the room. Disinfection rooms (soiled utility rooms) are located in each module or sometimes at each patient room. The sliding door windows, the monitoring room windows, and the exterior windows all have blinds. The patient room informally provides a place for family along the exterior wall.

Kungälv ICU

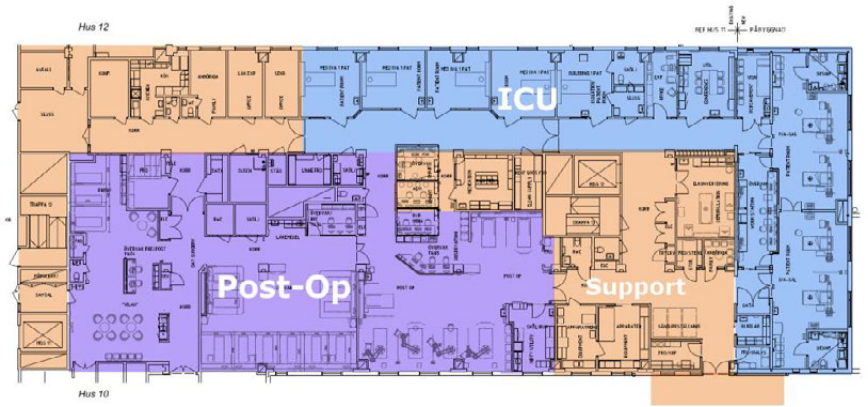
Kungälvs sjukhus is a community hospital with about 200 beds. The hospital first opened in 1870 with 30 beds. The hospital was rebuilt in 1964 and since then has experienced several renovations and expansions. The ICU was built in 1984 and consisted of seven single-bed rooms. The new ICU renovation/expansion was completed in February 2012 and included the addition of two new double-bed rooms. Five existing single-bed rooms are still in use, for a total of nine beds. One previous single-bed room is used as a conference room, but in the future could be used as a patient room again if needed.

The ICU department is adjacent to the Post-Op department. A renovation of the Post-Op department was completed in November 2012, including a renovated monitoring/documentation room for the single-bed ICU rooms. Staff rotate shifts working in the ICU and Post-Op departments.

Reasons for developing the new project include the need to have larger patient rooms that can accommodate modern equipment, as well as to reduce costs of staffing. For example, in the previous unit with all single rooms, if a patient was on a ventilator then an assistant nurse would need to stay in the room all the time. Now with the double room available, the assistant nurse can watch two patients at once. During the design, specific effort was made to create a nice environment, for example with large windows, accent colors, sound-absorbing materials, and to keep the ceiling above the patient uncluttered.

The unit layout consists of the single-bed patient rooms along a primary corridor and the double-bed rooms at the end of the corridor. Support spaces are located in the middle and shared with Post-Op. The unit includes one family room near the double-bed patient room, a family room near the main entry to the unit, and a family sleeping room and kitchenette just outside the unit. A staff lounge and offices are located on one side of the unit, adjacent to the operation department (just below bottom right of plan in Figure 12). A bereavement room is located on the primary corridor, next to the double-bed rooms.

Figure 12 – Kungälv ICU - Overall Plan (White arkitekter 2012a)



All the single-bed patient rooms have observation windows to the corridor, and an elevated central monitoring station can see into four of the five rooms. The single-bed patient rooms have headwalls behind the patient bed to locate equipment, outlets, and gasses. A soiled utility room to serve the single-bed rooms is located across the corridor. Patients with contagious infection and patients near end-of-life are referred to single-bed rooms. Higher acuity patients are usually placed in the double-bed rooms, and lower acuity patients in the single-bed rooms, creating an area that functions similar to an Intermediate Care Unit. This area (5 beds) is usually staffed by 2 nurses and 2 assistant nurses (a ratio of 4:5).

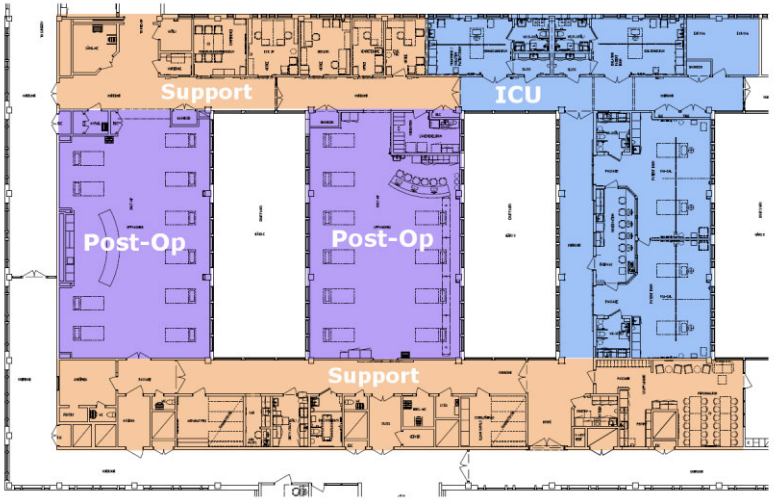
The double-bed rooms form a module of two rooms with a connected monitoring room overlooking both rooms (four beds). The patients are often oriented toward the monitoring room so staff can see the patient's face, however it is possible to rotate the beds 45 degrees so patients can watch TV, or to rotate the beds 180 degrees so patients can look out the window. The double-bed rooms feature relatively large windows compared to other units. Pendant systems are provided to allow equipment to be located on either side of the patient. Mobile screens/partitions are used between the beds to provide a degree of visual privacy for the patient. Each double-room has an attached disinfection room for cleaning supplies. The monitoring/documentation room also functions as a medicine preparation station.

Mölndal ICU

Mölndals sjukhus is a community hospital with about 160 beds, which first opened in 1934 with 77 beds. Before the recent ICU renovation, the Mölndal ICU consisted of two single-bed isolation rooms and three other ICU beds as part of the Post-Op area. The newly renovated ICU was completed in March 2010 and contains two single-bed rooms and four beds in double-bed rooms. One single-bed room is used interchangeably as a treatment/procedure room. The IVA and Post-Op units are interdependent, sharing support spaces and with staff rotating shifts at each unit.

The unit layout features two primary corridors with the Post-Op and double-bed rooms in between. A staff lounge, family room, and bereavement room are present in the unit. There is no place allocated for overnight family accommodations, since it is preferred that family members have a chance to rest and recuperate back in their normal environment before returning to the clinical environment

Figure 13 – Mölndal ICU - Overall Plan (YLP arkitekter / Västfastigheter 2012)



The normal staffing ratio in the ICU is to have one nurse and one assistant nurse assigned to a patient "space" – this space could be two patients in a double room or one patient in a single room (ratio 2:2 or 2:1). Therefore, the single patient rooms are very resource intensive in requiring twice as many staff per patient, and are only used when necessary because more staff are required to maintain effective observation. For most patient conditions, the assistant nurse is always present in the room, while the nurse comes in and out during the day. Nurses determine which situations are appropriate to use the single-rooms, such as for contagious patients or patients near end-of-life.

The single-bed rooms are along a primary corridor, and each room as its own disinfection room and ante room ("sluss") since the room is designed

for isolation purposes. The single-bed rooms do not have observation windows to the corridor.

The double-bed rooms consist of a module of a common monitoring room overlooking both rooms (four beds). The monitoring room also acts as a staff workspace for charting, paperwork, and medicine preparation. Each double-bed room has its own disinfection room. A movable screen/partition provides visual separation between the two patient beds in the double room.

Both single-bed and double-bed patient rooms feature ceiling-mounted pendant systems and ceiling-mounted patient lifts. The ceilings were designed to minimize clutter and equipment directly above the patient's view.

Common Goals

The three projects share many common goals, listed below. Various strategies were used in each unit. Concepts based on these goals were used as a foundation for determining items to evaluate in the study.

- Adequate space for staff and equipment
- Support of family involvement
- Low noise
- Patient privacy
- Pleasant interior design
- Observation/staffing capacity/efficiency
- Supporting patient sensory orientation
- Dignified spaces for dying and bereavement

Figure 14 - Key Design Strategies Used in Each ICU

ICU Projects / DESIGN STRATEGIES	Rooms for family respite	Amenities for families	Conveniently located sinks	Ceiling lifts	Ceiling pendant equipm. systems	Observation window for nurse	Single-bed patient rooms	Larger patient rooms	Individual patient toilets	In-room charting/documentation
Kungälv ICU	●	●	●	○	◒	●	◒	●	◒	◒
Mölndal ICU	●	◒	◒	●	●	◒	◒	●	◒	-
NÄL ICU	●	●	●	○	●	●	●	●	○	●
Utrecht ICU	●	●	●	-	●	●	●	◒	○	●

● *Includes feature* ○ *Does not include feature*
◒ *Partially includes feature* - *Information not known*

8. Study Methodology

Criteria to evaluate and methods to utilize were determined based upon ability to achieve the four identified *Study Objectives.* In order to determine study aims and focus, a review of unit design goals and pressing research needs was performed. Then, the *Highlighted Topics of Review* were identified, as stated earlier in this paper. Objectives primarily focus on the environment of the patient room module.

In order to clarify the relationship between the environment and respective outcomes, the following hypotheses were created:

- Sliding doors connecting patient rooms provide a useful method for varying between single bed rooms and double bed rooms.
- Compared to single-bed rooms, double bed rooms have reduced privacy and confidentiality.
- Compared to single-bed rooms, double bed rooms have more effective and efficient patient observation.
- Compared to single-bed rooms, double rooms provide more opportunities for staff interaction (e.g. sharing information, peer back-up).
- The rooms are supportive of allowing capable patients to look through exterior windows.
- Staff find the interior design of the new rooms to be pleasant and attractive.

These hypotheses were tested for validity as part of the study.

Figure 15 - Overview of Evaluation Methods Used at Each ICU

	NÄL ICU	Kungälv ICU	MölIndal ICU
Walk-Through Tour	●	●	●
Intro Interview	●	●	●
Physical Traces	●		
Plan Analysis	●	●	●
Open-Input Poster		●	
Questionnaire	●	●	●
Observation / Mapping	●	●	
Follow-Up Interviews	●	●	

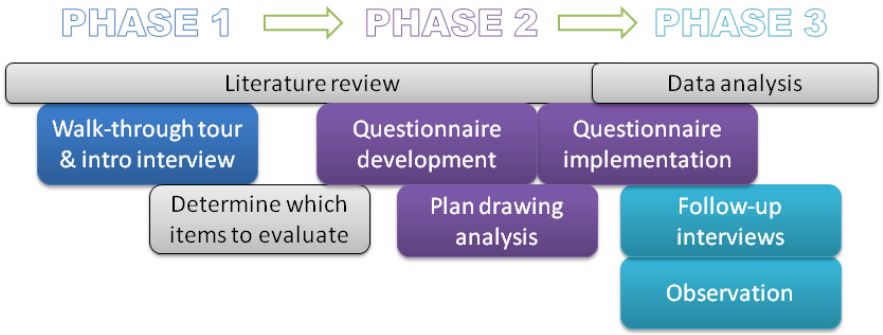
The design of this study uses a phased multi-method approach inspired by several previous studies. (Friesen et al., 2008; Preiser et al., 1988; Shepley & Wilson, 1999) A phased approach allows the information from one method to inform the implementation of subsequent methods, as in the "Grounded Theory" approach. (Bell, 2010) The methods used in the study included both self-reported measures by staff, both quantitative and qualitative, as well as qualitative and quantitative observations made by the researcher. The specific methods used, especially questionnaires, behavioral mapping, and interviews, are commonly used methods in facility evaluation. (Shepley, 2011)

After determining each of the three units to collaborate with, initial contact was made and basic data about the unit designs began to be compiled. The study was approved by the unit managers at each hospital. The study was exempt from requiring ethical approval by the author's university since the study did not involve any sensitive personal data,

influence a person, or include physical interventions affecting a person. (Chalmers, 2009; EPN, 2003) The unit manager informed staff at the unit about the study. All data was collected anonymously.

The first phase of evaluation at each unit included a walk-through tour of the unit and an interview with the nurse manager. The evaluation was continued with a second phase which included staff questionnaires. Overlapping with the second phase, a third phase was conducted at two of the units which included behavioral mapping (observation) and follow-up interviews. The following sections describe the design and implementation of each method and what type of data it resulted in.

Figure 16- Overview Process of Study



Introductory Interview

An introductory interview with a nurse manager (often accompanied by an assistant manager) was the first method implemented in the study. Each interview was semi-structured and lasted 30-60 minutes. The interview began with an explanation of the study, learning the unit's model-of-care, and explorative questions focused on learning the goals of the unit design and overall opinions regarding the results of the design.

The tangible outcome of the interviews were a written narrative describing the unit, the design strategies, and the design outcomes.

Walk-through tour

Directly after the introductory interview, the unit manager led the author on an interactive tour of the unit. The methodology of the tour was inspired by Blakstad et al (2008). The route of the tour was unique in each unit due to different unit layouts. The tour involved visual observations of the environment, explanations of key features by the unit manager, and exploratory questions by the author. Questions focused on learning the reasons and meanings of certain environmental characteristics, as well as any noted outcomes or responses. The tangible outcome of this method was a written narrative, merged with that of the interviews.

Physical traces analysis

On each visit to the unit, the author observed for characteristics, traces, and artifacts in the environment that imply a certain type of behavior is occurring or that an architectural feature is not functioning as intended. Methods of analysis were inspired by Martin & Hanington (2012) and Malkin (2008). Photographs taken at the unit were also reviewed. The tangible outcomes of this method included photographs and written notes relating to certain features of the environment.

Plan analysis

The plan drawings of the previous unit and the existing unit were analyzed and compared. Areas of focus included room sizes, room relationships (and flows), visibility and observation capacity, and any differences that may have been expected as a result of the new design strategies used. Analysis of visibility in the unit was initially inspired by Lu & Zimring's methodology of analyzing visibility in a neuro ICU (2011), and

adapted based upon cultural and contextual factors. Room sizes were compared to recommendations by the Swedish Society for Care Hygiene (SFVH, 2010), by Sahlgrenska (Gustafsson 2012), and Hamilton & Shepley (2010). The tangible outcomes of this method included diagrams and a written narrative describing design strategies and potential effects on outcomes.

Open-input poster

At one unit, a poster was placed in the staff lounge in order to solicit open staff comments. The method of data collection was inspired by Martin & Hanington (2012). The poster consisted of four short questions serving as prompts, and a large amount of blank space available for freely commenting. The tangible outcome of this method was a written narrative of opinions about the design, and was merged with the interview narratives.

Questionnaires

A two-page questionnaire was developed and given to staff to garner feedback about selected design outcomes. The questionnaire was completed online in Mölndal ICU and NÄL ICU and on paper at Kungälv ICU, based on the preferences of unit managers. The format of the questionnaire was inspired by Shepley and Wilson (1999) by including demographic information, Likert scales, and open-ended questions. The questionnaire was developed in English. Before translation to Swedish, the questionnaire content and format were reviewed by nurse researchers. After translation, the questionnaire was reviewed by a nurse architect and a nurse manager at each unit. The tangible outcomes of the questionnaires were quantitative datasets and narrative opinions about the environment generated from the open-ended questions.

Follow-up interviews

During phase three of the study, follow-up interviews were conducted with two nurses at Kungälv ICU and three nurses at NÄL ICU. The interviews were semi-structured, using predefined questions while also allowing some freedom to explore a topic. The interviews focused on bringing greater clarity and depth to the information discovered in earlier phases of the study. The tangible outcome of the interviews was a written narrative. The narratives of the interviews and of the questionnaires were merged, and content analysis was performed to determine themes.

Observation / behavioral mapping

Observation was performed for 2 hours at Kungälv ICU and 4 hours in NÄL ICU. Observational techniques were inspired by Shepley's observations in a neonatal ICU (2002) and Kukla & Clemens ethonographic studies. (Horgen, Joroff, Porter, & Schön, 1999) The focused space of observation was the patient room module. The author remained in the monitoring room or in an adjacent corridor and recorded on a plan drawing the locations/flows of movement and the type of interactions that occurred. Most observation sessions recorded information about all users in a space, while some sessions focused on the flow and interaction of a specific nurse. Information regarding the time of day, the presence of family members, and the location of window blinds was also recorded. The tangible outcomes of the observation sessions include diagrams of flows and interactions and a written narrative describing activities and the author's reflections.

9. Results at NÄL ICU

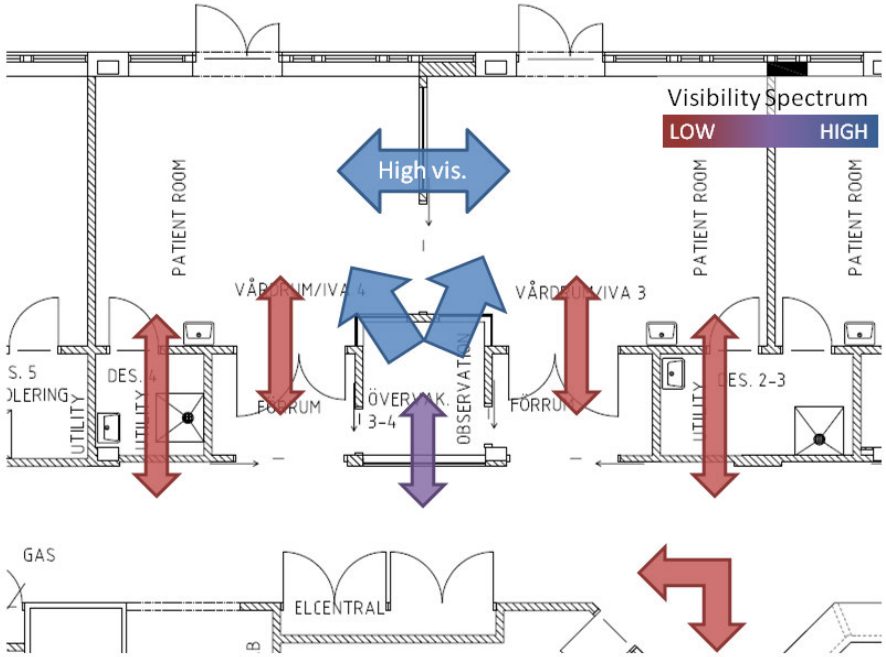
Plan analysis

The previous NÄL ICU layout consisted of 2 four-bed rooms (mostly post-op patients), 2 single-bed isolation rooms, and 2 modules of double-bed rooms. Each module contained two double-bed rooms separated by a common disinfection room and workstation. The new design is similar in terms of types of rooms in the module, but different in the number of patients per module. In both the old and new module designs, two staff work together to care for two patients. However in the new design there is a wall between the two patients. This wall as a dividing element can be either transparent or opaque, depending on the location of the sliding door and the blinds.

The average size of the new patient rooms is 31m², exceeding Hamilton and Shepley's 2010 recommendations of 30m² and the Swedish recommendations of 25m² (SFVH 2010). The room width and length dimensions are similar to those recommended by Hamilton and Shepley.

Analysis of visibility in the unit cannot be done in the same way as in other cultural contexts (e.g. USA), but must be adapted to fit the Swedish model of intensive care. In the traditional Swedish model of care, a nurse or assistant nurse is present in the patient room nearly all the time. In countries where staffing ratios are 1:2, nurses are more often travelling between rooms, and are more dependent on alarms or observing via a window.

Figure 17 - NÄL ICU - Visibility in the Patient Room Module (plan underlay from (White arkitekter 2012b))



At NÄL, visibility of the patient room from the corridor or the central nurse station is low. Patient room doors are opaque. Visibility from the corridor is possible via the monitoring room by looking through two windows. Within the patient room module, visibility from the monitoring room to the patient room is high. Between the patient rooms there is a large window and a sliding door (with windows), providing high visibility from one patient room to the other patient room.

Regarding the unit layout, two patient rooms are located along a secondary corridor, an area of lesser visibility from the primary corridor.

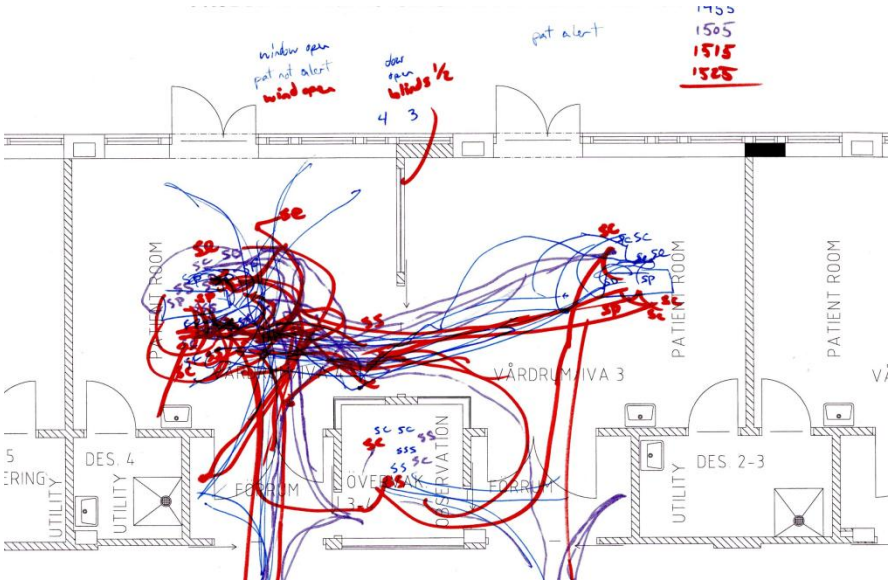
The patient room is designed to allow a hierarchy of access to supplies. Items used most often are stored in the patient room, some items are stored in an alcove just outside the room, and other items are stored in rooms along the corridor. The distance to the central medication room is convenient for some rooms (10 meters) but much further for other rooms (25-30 meters).

Behavioral mapping, observations, and physical traces

Behavioral mapping and observation were conducted during 9 sessions, averaging 26 minutes each, for a total of 4 hours. The mapping occurred during one day, in both the morning and afternoon. The unit was near capacity, with ten patient rooms being occupied. The author stood in the back of the monitoring room observing the activities in the patient room module. Informal observations of activity and of "physical traces" were also performed in times other than the 9 sessions.

The observation sessions revealed that the environment of the patient room module is a place full of constant interaction. The presence of family or patients with higher acuity generally resulted in higher levels of activity.

Figure 18 – NÄL ICU - Example Behavior Mapping/Observation session showing time, movement, type of interactions and number of interactions



The main types of interaction include:

- Staff with other staff - most often verbally, and sometimes by visual contact (e.g. gestures) or by telephone
- Staff with a computer - for monitoring, charting, and documentation
- Staff with equipment - such as pendants, ventilators, IVs, gloves, aprons, pillows, disinfectant gel, medication, etc.
- Staff with family members
- Staff with the patient - this can include either communication with the patient or interventions performed on the patient
- Family with the patient
- Family with other family members

Family involvement

During the observation sessions, family presence was noted in four out of ten patient rooms. Family members were often present alone, but occasionally with other family. Stays in the room could last from a few minutes to more than an hour. The corner of the room at the patient's foot (at the exterior wall) was normally where family stayed, or else at the patient's side. Activities of family members included reading, looking at the equipment, sitting quietly at the patient's side, interacting with the patient (e.g. touch or voice), or talking with staff. In some cases family members appeared to act as mediators between the patient and the staff.

One or two chairs were always available for family to sit in the "family zone" corner of the room. In one instance a family member was using the patient's over-bed table.

Monitoring room

The monitoring room was most often used for staff conversations and for reviewing patient documentation – often both tasks simultaneously. The observation room allows effective observation into both patient rooms, although the field of view varies in different rooms. The clean and minimal glass corners are effective in allowing maximum visibility. Staff occasionally looked through the windows, as if they were keeping track of the surrounding environment and activities. Rarely did staff look at the patient monitor screens or "observe" the patient.

Figure 19 - NÄL ICU - A monitoring/observation room overlooking a patient room (Nilsson (Bohusläningen) 2010)

Conversations in the monitoring room generally lasted longer than conversations in the patient room, for example even sometimes longer than ten minutes. During some observation sessions the monitoring room was not used at all, and in other sessions the room was used extensively.

Task lighting was not noticed in the observation room, which if not present could cause excessive ambient light to enter the patient room at night. During the day, the position (up/down) of blinds in the monitoring room varied significantly, though they were often not moved during a 30 minute observation session. The author could not discern if the blinds were moved based on staff preference, type of procedure in the room, or a combination of factors.

Alarms could be seen and heard in the monitoring room, and the author was told that the same tone could be heard in the patient room. If a staff member working in one patient room heard an alarm in the other patient room, the person would often walk over to investigate the cause. If a staff in the monitoring room hears an alarm, often the person would look briefly into the patient room – if a staff member could be seen there then the person in the monitoring room would silence/pause the alarm ("pause" shows visibly on the monitor screen.)

Staff in the monitoring room responded differently to different types of alarms. For example, when the "APNE" alarm sounds (accompanied by a red light), the staff always look up to check. When the "RF Low" alarm sounds (accompanied by a yellow light) the staff were less responsive. The two alarms also have differing auditory tones. (The first alarm can signify a ventilator malfunction, and the second alarm can signify a change in respiration frequency.)

Figure 20 – NÄL ICU - Quantity of Interactions in the Patient Room during selected observation sessions

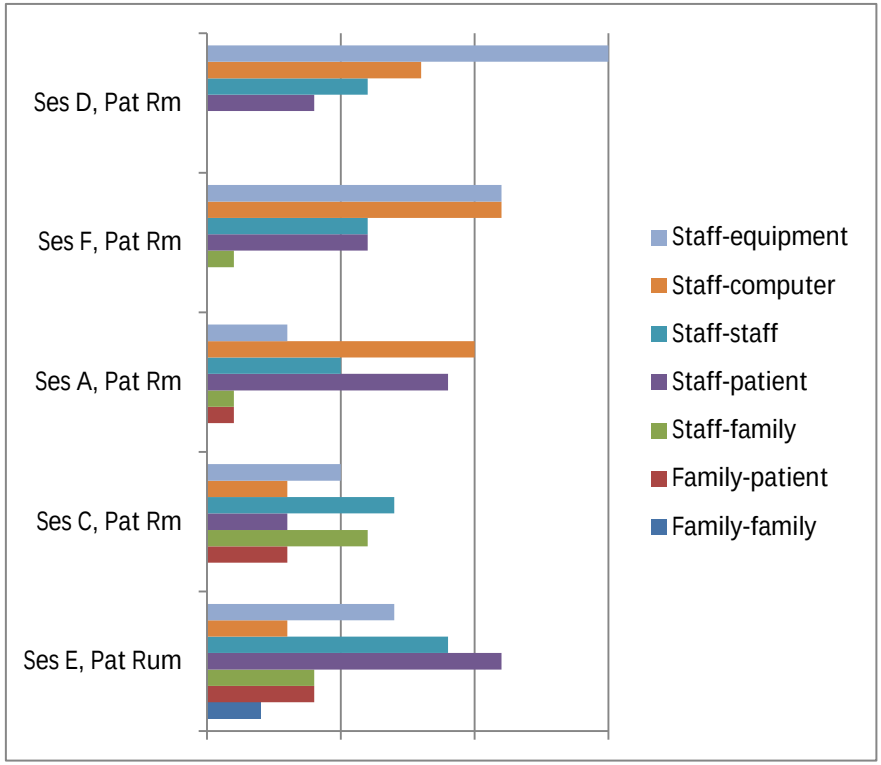
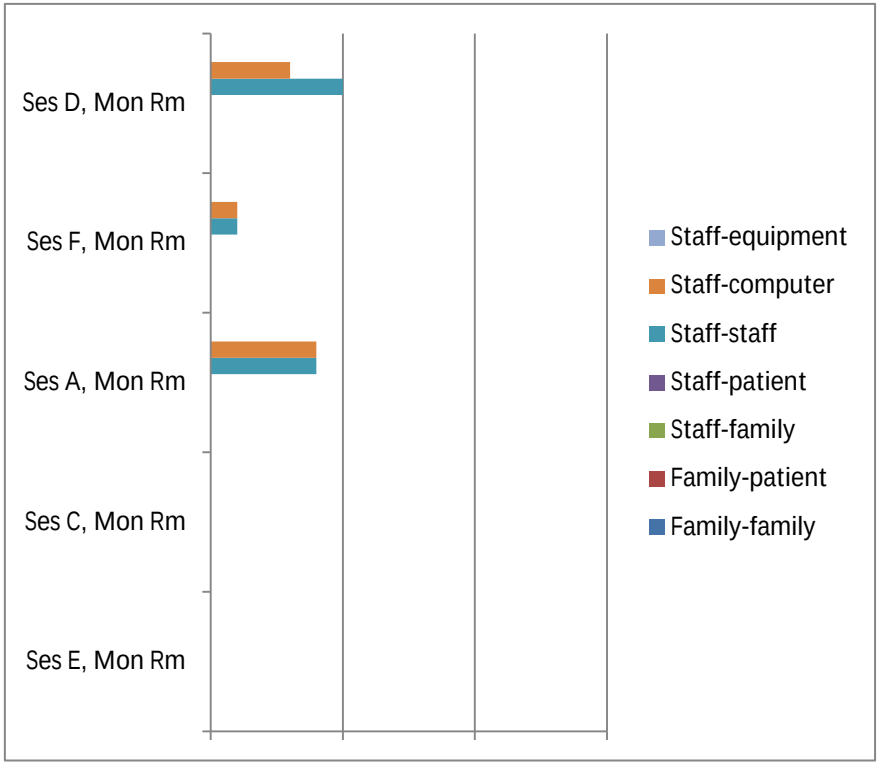


Figure 21 – NÄL ICU - Quantity of Interactions in the Monitoring/Observation room during selected observation sessions



Visibility, awareness, and access

In most situations, the sliding door was left open a small distance to allow some visibility, sound, and walking through. When the door was closed and a staff member wanted to pass to the other room, he/she could open the sliding door, or may opt to go around through the monitoring room.

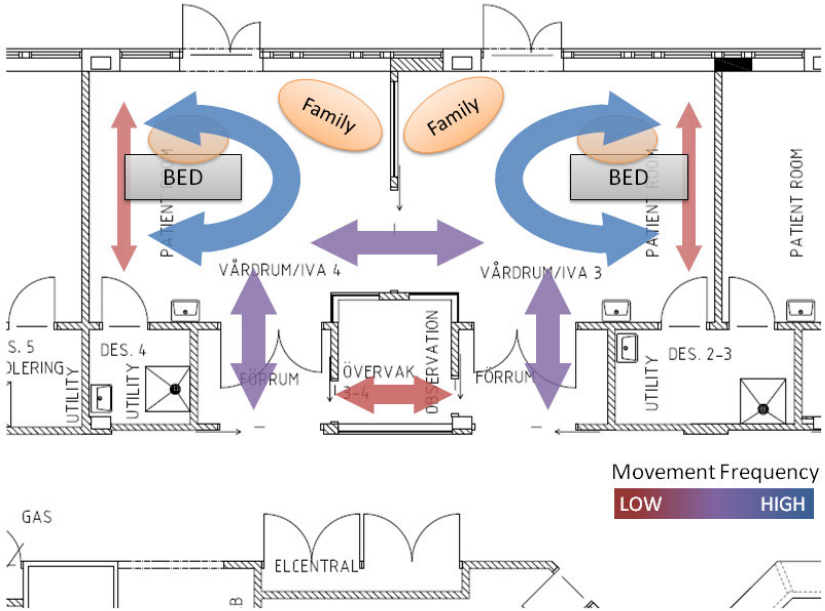
The sliding door is not only used for passage, but also as a meeting point for staff interaction and a base point where a nurse may sit or stand to have a good overview of both patients.

There is a high potential for visibility between the two patient rooms, via the large glass window, the windows in the sliding door, or opening the sliding door. Visibility is entirely dependent on whether the blinds are up or down. During most sessions the blinds were located half-up, and not adjusted during the session. From the patient room there is low to no visibility into the corridor.

Patient room environment

The most frequent area of movement is of staff circulating around the patient bed giving very personal and attentive care – monitoring, reviewing documentation, communicating with the patient, and adjusting equipment. Items may be located on one side of the bed or the other, and the nurse may go back and forth often. In this circuitous route, the nurse would often pause at the foot of the bed to use strategically placed hand disinfectant gel.

Figure 22 - NÄL ICU - Frequency of Movement in the Patient Room Module



The second most frequent circulation routes were staff going back and forth between rooms or staff entering/exiting the room. Family circulation routes mainly included entering/exiting the room and occasionally circulating around the patient be or between the bed and the informal "family zone." Staff would often leave the room temporarily to retrieve supplies from the adjacent storage alcove.

In most situations the patient appeared quite spacious, and even in one circumstance with 7 staff, 2 family, and a dialysis machine, the room still did not appear overcrowded.

Several times during observation sessions an exterior window was opened or closed. It was not observed that the pendants were moved. A stereo was observed in the corner of the room near the "family zone" to give opportunity to play personal music. A white board located behind the patient bed was used for informal staff communication/notification.

The exterior windows and doors varied significantly regarding type of view. Rooms 1-4 had frosted glass for the bottom half of the window, which causes most of the view to be of sky. In rooms 13-14 the predominant view was of shrubbery.

Overall unit

In general the corridors appeared open and not cluttered, with most equipment placed in alcoves. Several rooms were constantly empty during all observation sessions, particularly patient rooms 5-6 (isolation) and patient rooms 11/12 (double-bed room.)

The central observation station is rarely used. Occasionally a staff member may use a computer, have a conversation, or use the pneumatic tube to transfer items to the lab.

In two places there is a large TV displaying a chart showing phone numbers and assignment locations of various staff members. Several instances were noted of staff viewing and using the information.

Disinfectant gel is placed in locations dispersed throughout the unit, including at most doors, and even on both sides of some doors.

In many places around the unit, informal signs were posted to remind staff to do various things: a sign on a storage room stated to always leave the door closed, although sometimes the door was propped open; a sign on an equipment room said "here we only have clean equipment;" and a sign over a waste bin reminded staff to call the janitor to collect the garbage.

Interviews and questionnaires

The link to an online questionnaire was sent to all staff in the unit (nurses, assistant nurses, and physicians) by the unit manager. The questionnaire contained several locations for open-ended comments and solicited a significant amount of feedback. One week was given to complete the questionnaire and the response rate was 14% (37 of 250 staff). The preliminary results of the questionnaire and of the observation sessions were used to inform the three follow-up interviews. A total of four interviews were conducted, each lasting approximately 30 minutes.

Staffing

Many staff commented that the unit design necessitates a higher number of staff than in other units, and therefore also costs more. The most commonly mentioned design factor was the use of exclusively single-bed rooms. For most staff, an inherent comparison was between multiple-bed patient rooms where they had worked in the past. The unit has hired many new staff since opening the new unit, and in a time when ICU nurses are in high demand, the new unit has helped with recruitment.

The staffing ratio is usually 2:2 (one nurse and one assistant nurse for each two patients), and in some cases the ratio is 3:2 if a nurse is inexperienced or a patient is acutely ill. Some staff stated that the ratio of 2:2 created some difficulties in obtaining assistance and guidance, and on the other hand, that a ratio of 3:2 rarely required outside help to come in. An advantage of the patient room module layout is that a nurse cannot

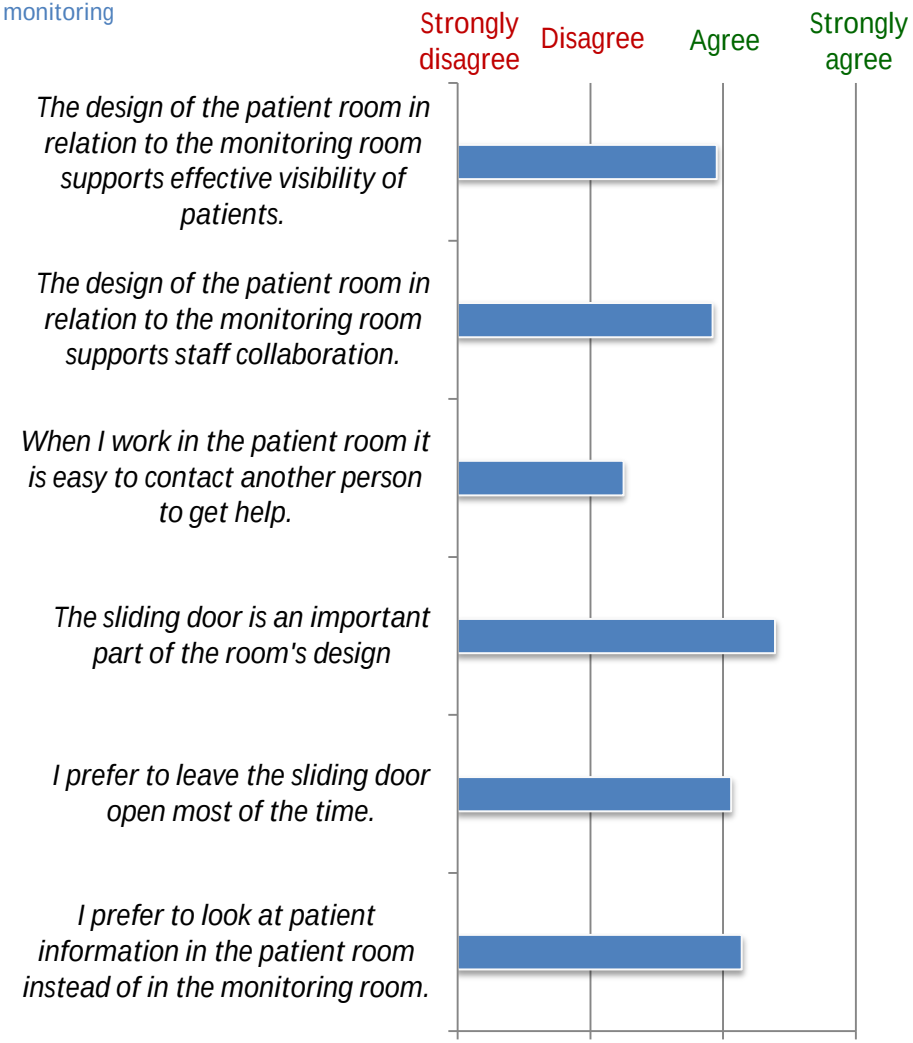
be assigned to more than two patients at a time, for example taking care of extra patients during a partner's lunch or breaks.

Even with a normal staffing ratio and care of two patients, opinions were divided. Some staff expressed uneasiness in taking care of a patient and not being able to see the other patient, even stating it is "completely hopeless to have two anxious patients." Others felt like "the design of the room provides good opportunity to work with one patient while having good control of the other patient." One person clarified, "It is not possible to monitor two patients without having the sliding door open between the rooms."

For many staff it was a difficult adjustment to learn how to work in the new environment. Common comments included difficulty in getting help, less collaboration, and an unawareness of what is happening in other areas. In order to address the adaptation challenges, the unit has assigned several staff to work in the "corridor" - to freely circulate and be "on-call" to help other staff when needed.

The construction process allowed staff to experience a variety of environments in a short time: the previous unit, a temporary ICU in a multiple-bed Post-Op setting, and the new unit. Compared to the new unit, the previous unit and the temporary unit provided enhanced visibility of staff presence and facilitated easier contact of other staff for quick help (often simple verbal contact). However, these units were noisy and offered little patient privacy.

Figure 23 – NÄL ICU - Questionnaire results relating to visibility, collaboration, and monitoring



Visibility, awareness, and togetherness

The patient room module often contains 2-3 staff working together caring for two patients. In many ways module acts as a self-contained unit, and these small staff teams have little interaction with the other staff, unless outside assistance is requested for a certain activity. Many tasks are done individually by a single staff member, and some activities can mean a long time in the patient room alone. The other nurse may be in and out of the room to accomplish tasks. For different people this creates different responses. Some staff describe this experience with words such as "trapped", "isolated", "alone", and "closed-in". Other staff use words such as "peaceful", "calm", and "focused".

As one person stated, the design "creates a good atmosphere in the room but it is difficult to understand what is happening elsewhere." There is a common desire to be aware of where colleagues are located, to be aware of activities in other areas of the unit, and to know when patients are entering or leaving the unit. One strategy that has been implemented is to locate large TVs on a corridor wall with a spreadsheet showing staff assignments and phone numbers.

Access to assistance

The design of the unit affects the way staff collaborate and request assistance. In the previous unit, "it was easy when you needed help, just open the door and shout, and someone came." In the new unit, contact for assistance is usually made by phone. In describing the process of accessing help, some staff used words such as "complicated" and "difficult". In the questionnaire, the item about having easy access to help received more negative response than any other item.

Some expressed that help seemed delayed or did not come as quickly as hoped. However, there was no concern if help would come or not. Staff had to learn how to communicate effectively in all types of situations, ranging from acute code situations, to making a phone call requesting back-up in order to be free to use the bathroom.

Similar to staff comments on unit visibility and awareness, two differing perspectives emerged regarding assistance. One perspective says, "should anything happen in the room, you are very vulnerable," while the other perspective says, "this is a quiet working environment and I can just call for help when needed."

Staff learning is also affected. New nurses "can't just look around to watch and learn like before in the more open previous unit." Even for more experienced nurses, there is less opportunity for discussing care ideas and receiving feedback than in an open environment.

One person stated, the unit design "does not prevent [collaboration and interaction]. Imagination is the only thing that sets the limits."

Monitoring / charting / observation room

The monitoring room in each module is used for rounds and for reporting at shift change. Other conversations are also held in the monitoring room, such as a phone call to the lab or a discussion between a physician and a nurse. The room is particularly useful at night when all conversation is avoided in the patient room, if possible, to enhance patient sleep.

When an alarm sounds it can be heard in the patient room and in the monitoring room. In the room there are two monitoring screens, one for each patient, showing various physiological measures. However, there is

only one computer, so when viewing patient documentation staff must be careful to view the record of the intended patient.

Other than for the purposes stated above, there is a mixed opinion on whether the room can or should be used for charting, documentation, observation, and monitoring. These tasks can be performed both in the monitoring room and in the patient room. As one person stated, "optimally for me is to get the patient information, and at the same time and equally important, to see how the patient is feeling." Several concerns were expressed about the ability to do both of these tasks successfully in the monitoring room, and as a result many staff do charting and monitoring on the computer in the patient room rather than in the monitoring room. One person clearly stated, "the monitoring room is not used to monitor the patient. We split our time in each patient room 50/50." In comparison, another response stated, "patient information is easier to obtain in the monitoring room where you have a better workstation and are less disturbed by monitoring, etc."

Specifically, the strongest reason for low utilization of the monitoring room was the inability to hear sounds in the patient room. One person stated the concern clearly: "one cannot monitor the patient safely from the monitoring room." In response to this, several suggested having an operable window in the monitoring room. One suggestion also was to have a door directly from the monitoring room to the patient room, to hear what is happening in the room and to be able to respond more quickly.

In some cases, staff expressed that there were situations that could potentially benefit from using the monitoring room more. For example, during afternoon patient rest time, and during nighttime, the nurse could as effectively work in the monitoring room if it were possible to hear the patient room. In the current situation, the nurses are almost always in the patient room, which provides excellent care "but never gives the patient a moment of complete privacy."

Figure 24 - NÄL ICU – From left: entry door, monitoring room, sliding door, and connecting window

Patient room connection: sliding door

Nearly all staff were very positive about the presence of the sliding door connecting the two patient rooms, in both the interviews and questionnaire. Some expressed how the lack of a connecting door could increase walking distances and increase the number of staff needed. One comment even suggested an expansion of the idea: instead of having each pair/module of rooms connected with a sliding door, have the whole

row of all patient rooms connected. Potentially then staff could be aware of their coworkers in many rooms at once.

The sliding doors allow the patient rooms to transform between being a double-bed room or being single-bed rooms as the situation and context requires. Often, "the sliding door is open about one meter to allow us to supervise both patients." Reasons for occasionally closing the sliding door include busy and noisy care times, or if family members are present. The doors may be closed and locked in the case of an immuno-suppressed patient.

One comment expressed a concern that the easy ability to pass between rooms could allow staff to pass from one bed to another without changing aprons or gloves.

Patient room connection: window

A large window with blinds is located between the two patient rooms. The presence of this window seems to create a dilemma in staff between patient privacy and improved observation. If a patient is very ill it can be beneficial to have a full window view to better keep track of both rooms. Most often, the blinds are half-up to block the view of the patient to the other room, but to allow the staff to view. One comment expressed concern that the family of one patient could look through the window into the other patient room. There is also a window between the monitoring room and the corridor, without blinds – if the blinds are open in the monitoring room, it is possible to look from the corridor into the patient room. One staff member noted concern about this reducing patient privacy.

Several comments spoke of the impact of lighting at night. When one patient is sleeping and care activities are being performed in the adjacent patient room, ideally the staff will first put up the blinds all the way before turning on the light, but sometimes there is no time or it can be forgotten.

Comments on overall unit design

A main medication room is centrally located in the unit. At the beginning of a shift, the nurse tries to gather what is needed, but it is still common to need to go back and forth to the room.

The two isolation patient rooms are not used often. Instead of having one big sliding door between rooms, the isolation rooms have two smaller swinging doors, and a higher staffing ratio must be used compared to the other patient rooms.

Patient room 8 was noted by several people to be different from other rooms. The room is slightly smaller. More significantly, the main doors to the room are located behind the patient's head (also the pendants), which increases difficulty in bringing beds in and out of the room.

Patient room environment

Despite conflicting opinions regarding staff and collaboration and visibility, staff were generally positive about the patient room environment. As one person stated, "this is the best possible environment for both patients and families." The many positive comments included improvements in privacy, room flexibility, patient-family communication, staff focus, and patient calmness. The space available around the bed was noted to be adequate, and the bed can be rotated to give patients a better view through the window. Patients are

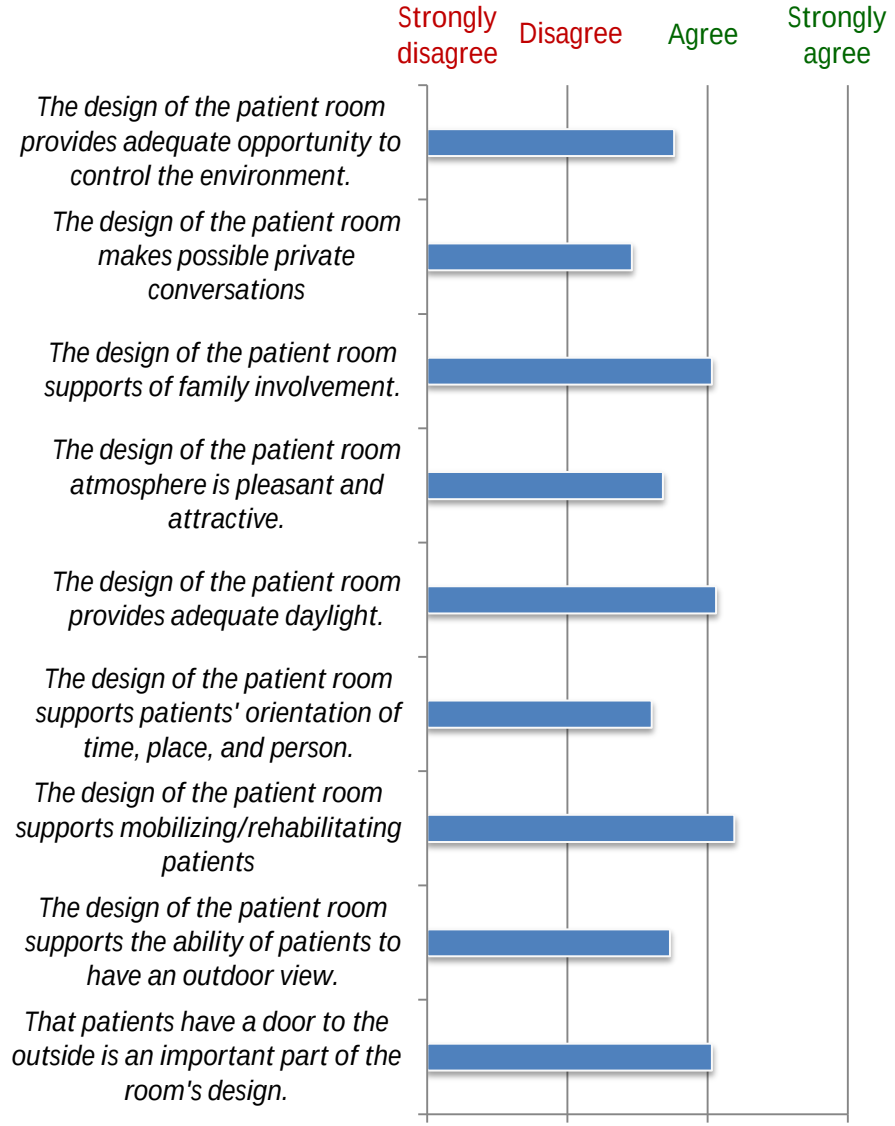
also less disturbed by their “neighbor”. As one person stated, “I like our single!”

In describing the atmosphere of the patient room, a few comments described the space as “bright”, “fresh”, and “airy”. However, a greater number of comments reflected themes such as “sterile”, “impersonal”, and “bare”, and the room atmosphere received negative results on the questionnaire. Comments recognized that patients and families could have similar feelings, for example a more recovered patient could potentially benefit from more stimuli in the room.

The patient room has electric lighting options including orange-colored lights from the pendants (toward the ceiling), or a family reading light, or low lights on the walls. One person commented that at night the orange colored lights make the patient look an unnatural color and it is harder to gauge the patient’s condition. Staff aim to keep the lights dim/dark during the night, but it can be difficult to control light entering a patient room either from the outdoors, from the monitoring room, or from the adjacent patient room.

In general staff appreciated how the pendant systems gave a flexible working environment and a clean floor space, but several logistical and ergonomic issues were noted. Several staff noted that the pendants are difficult to move, and not moved often. The pendants can hinder access to certain items such as gloves and alarms, as well as hindering some tasks: “…such as placement of suction catheters and sharps containers."

Figure 25 - NÄL ICU - Questionnaire results relating to the patient room environment



Daylight and views

The patient beds are oriented perpendicular to the exterior wall, and patients who are alert enough are able to turn their head to look out the window. Sometimes staff can assist with extra rotation of the bed. Each patient room has a different view condition, which in some cases caused staff concern about a lack of daylight and/or a lack of a quality view (of sky, nature, surroundings). Specific hindrances include tall shrubbery located within 2 meters of the window and the presence of half-height frosted glass (translucent). While no reasons were stated for the presence of the shrubbery, it was stated that the frosted glass was added after the completion of the building in order to improve patient privacy. The ICU is located on the ground floor, and some rooms overlook a driveway. Blinds can also be used to cover the windows. Some staff had a personal dilemma: appreciating the views and light, but concerned about patient privacy.

Fresh air and outdoor access

Four regular patient rooms and the two isolation rooms have doors with direct outdoor access. In general staff are positive about having outdoor access available, but there is no consensus on its usefulness and utilization.

The exterior doors are opened sometimes if a patient feels warm, or to give fresh air, "especially if the weather is nice and the patient is alert." Sometimes the patient can ask to open the doors and/or to go out, other times staff initiate the request. If the patient is in the unit for a long time, they will probably have an opportunity to sit/lay next to the open doors. However, it is a significant endeavor to provide this opportunity, sometimes necessitating 3 or 4 staff members, and it is not done often.

Figure 26 - NÄL ICU - Adequate size windows in the room, with a view of shrubbery

Figure 27 - NÄL ICU - Light and views through an exterior door, on grade, before the bottom door lites were frosted. (Ek 2012b)

Only the two isolation rooms actually allow the patient bed to be taken completely outside. In the other rooms, the patient can remain in the room and be placed in front of an open door.

In the previous unit patients would also be brought to outdoor access occasionally, but they would have to pass through a corridor.

Patient room size and noise

In the questionnaire and the interviews, most staff were satisfied with the size of the patient room. Comments were made that not all rooms were the same size or layout, which can affect the care. Patient mobilization was said to be easier in the larger room, for example bringing a special chair into the room for the patient to try getting out of bed. In some cases of mobilization or in cases of much equipment running at the same time the room was said to begin to feel crowded.

In the questionnaire and the interviews, most staff were also satisfied with the noise levels in the patient room. Nearly all comments on noise concerns were in relation to the technical equipment around the patient bed, such as alarms and the humming of machines. Some stated that alarms were too loud, last for too long, or are not adequately adapted to specific situations/patients. One response summarized by saying, "The patient has a lot more peace and quiet and is not disturbed by other patients. But some light enters the other room when we work at night. And if the neighboring patient screams it is still heard in the room next door."

Family involvement

In general staff were quite positive about the level of family involvement in the unit. When asking one nurse how it could be encouraged more, the response was that it did not need to be; more often the need actually is to encourage family members to take a break to rest or eat. Relatives are on the unit every day, sometimes in all rooms

Family involvement is better in the single-bed room design than in the previous unit. There is more space and it is quieter. The previous unit had a limit of two visitors per patient, and in the new unit there is no limit.

In each patient room there is one or two chairs in a corner, designated for family use. However, family can be in any part of the room, not restricted to a certain space. In some cases a family member has slept in the chair overnight, and one comment suggested it would be nice to have a fold-up bed available in the room. Sometimes staff bring in another patient bed so that family can stay overnight in the room.

One person suggested that it would be helpful for the patient room to have a place for family belongings, such as even a hook on the wall for a coat.

Family members spend more time in the patient room than in the designated family rooms. Family may need to leave the patient room to rest and recuperate, or may be asked to leave temporarily if the staff must wash the patient or perform a procedure. The family rooms include a small lounge and three small adjacent sleeping rooms intended for short stays, particularly for family coming from far away. Instead of a bathroom being available in the family room, one is located a 5 meter walk across a public corridor. Staff commented that family members could experience this as unpleasant trek during a late-night trip to the bathroom. The family rooms are used often.

Overview of Results at NÄL ICU

In many ways staff are pleased with the results of the new unit, especially in terms of creating a better environment for patients and families. The increased room size gives adequate space for increased family involvement and patient rehabilitation.

There is great satisfaction in having the sliding door between patient rooms. Staff accessibility is increased and potentially the number of required staff is reduced. However, the presence of the sliding door and of the connecting window can be detrimental to visual and auditory privacy and light trespass at night.

There is a dilemma regarding the quality of outdoor views and privacy. The doors to the outside are appreciated but are not used often.

There is also a dilemma in that though the patient room environment is private and calm, staff miss the opportunity to be aware of their broader surroundings. Particularly, requesting help can be challenging.

The monitoring room is successfully utilized as a place for conversations and sometimes for charting/documentation. However staff prefer to be in the patient room when monitoring and observing the patient.

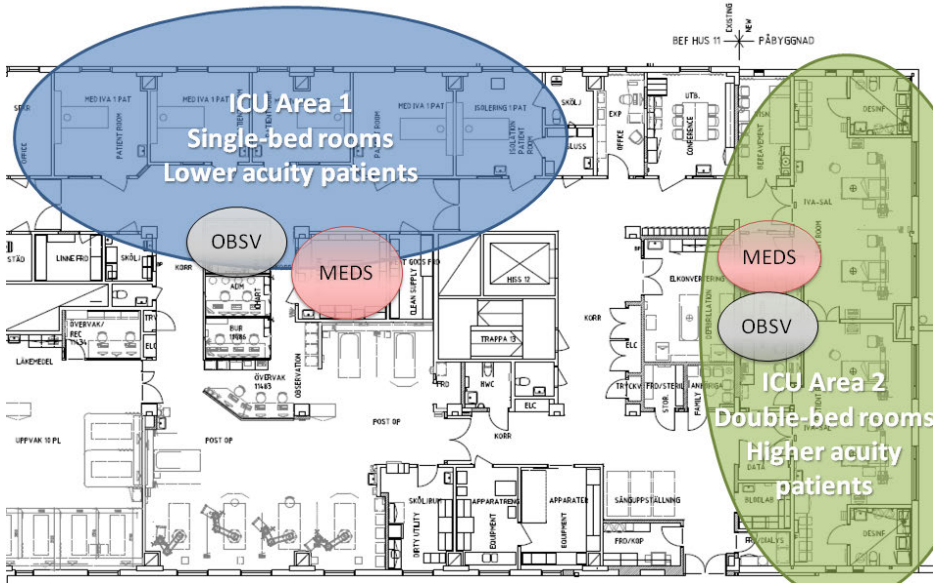
Figure 28- NÄL ICU - Central Nurse Station

10. Results at Kungälv ICU

Plan Analysis

The previous Kungälv ICU consisted of single-bed patient rooms lined up on one side of a single corridor, with an observation/monitoring station on the opposite side of the corridor. As the single-bed rooms only underwent cosmetic renovations, the same exact layout remains today. To walk to the new double-bed rooms 30 meters away, one must pass through a door and reach the end of the corridor. In terms of design layout and of type of care, the two areas in some ways function independently. Each area has its own observation/ monitoring/ documenting area and own medication preparation station within a close distance.

Figure 29 – Kungälv ICU - Distinct Functional Areas



The single-bed patient room on average is 21m², which is smaller than the Swedish guidelines of 25m² (SFVH 2010). Considering that the unit was built in 1984 this is not surprising. For example, many award-winning American ICUs in the mid-1990s were 24m². (Cadenhead and Anderson 2009) Since these patient rooms are now primarily used for lower-acuity patients, this room size may be adequate.

The double-bed patient room size includes 23m² for each patient bed. The Swedish guidelines recommend a room size for a patient "place" in a double-bed room of 20m² plus the area of the bed. Assuming a bed area of 2m² then this room size meets the target size. However, the width of the bed place is 4.3 meters, which is smaller than guidelines recommended by Hamilton and Shepley (2010) or by Gustafsson (4.6m). (2012)

Levels of visibility provided in the design are significantly different in the single-bed area and in the double-bed area. This may be appropriate in order to serve patients of differing acuities. The single-bed rooms have windows to the corridor, and the observation/monitoring station has a direct view into 4 of the 5 rooms, though the station is 6-8 meters away. Medium to low levels of visibility are provided into the single-bed patient rooms, and medium levels of staff visibility/awareness of the unit as a whole. Double-bed rooms have high levels of visibility from the adjacent monitoring room, low levels of visibility between rooms, and low levels of visibility/awareness to the unit as a whole.

Figure 30 - Kungälv ICU - Visibility in the Single-Bed Room Area

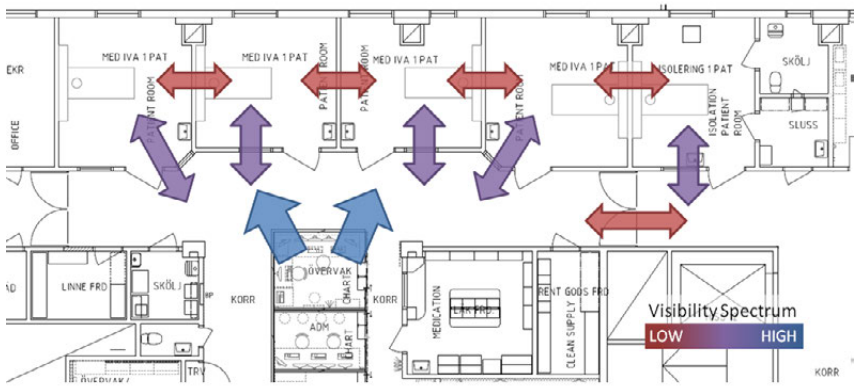


Figure 31 - Kungälv ICU - Visibility in the Double-Bed Room Area

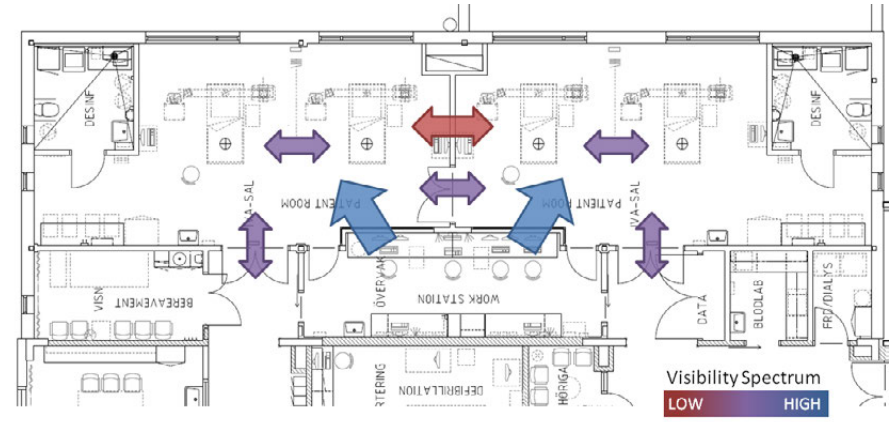


Figure 32 - Kungälv ICU - Visibility from the observation/documentation room (glass) into single-bed patient rooms (room doors open in photo)

Behavior Mapping / Observation

Observation/mapping sessions were performed at Kungälv ICU, in a way similar to that done at NÄL ICU. Seven sessions of observation/mapping were performed in Kungälv ICU, with an average of 19 minutes per session, for about 2 hours total. Observation sessions were performed during the afternoon, and informal observations were also noticed on other days/visits to the unit. For observations of the single-bed rooms, the author stood in the corridor, adjacent to the observation station. For observations of the double-bed rooms, the author stood in the observation room/workroom.

Single-bed area

Quite different patterns of movement and of interaction were observed in the single-bed area compared to the double-bed area. In the single-bed area (example session shown, The entry doors of all single-bed patient rooms were open, allowing greater visibility for staff, and also allowing patients to be aware of people passing in the corridor (about a person passing each minute, on average). Standing in the corridor, the author could hear conversations in the patient room, even discerning some words. All single-bed patient rooms have windows to the corridor. In some rooms the window blinds were up and in other rooms the blinds were down. Disinfecting hand gel is located outside each patient room door, and staff often used the gel when entering and exiting the room.

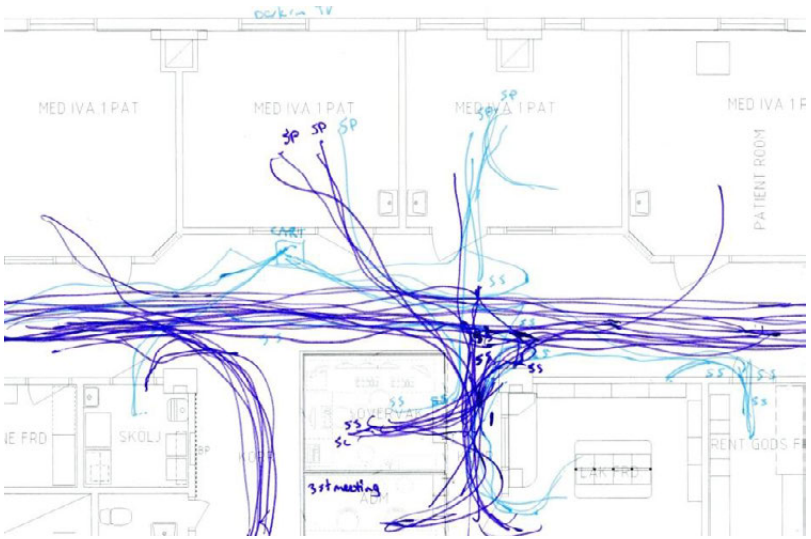
Figure 33), movements in and out of patient rooms were generally infrequent. Patients in these rooms were alert and could communicate effectively with staff. Staff presence in a patient room was usually not for a long duration (a couple minutes each time, or sometimes less than one minute). Usually staff members worked alone.

The entry doors of all single-bed patient rooms were open, allowing greater visibility for staff, and also allowing patients to be aware of people passing in the corridor (about a person passing each minute, on average). Standing in the corridor, the author could hear conversations in the patient room, even discerning some words. All single-bed patient rooms have windows to the corridor. In some rooms the window blinds were up and in other rooms the blinds were down. Disinfecting hand gel is located outside each patient room door, and staff often used the gel when entering and exiting the room.

During the single-bed room sessions, 2 of 4 patients were watching TV, presumably with captions and/or headphones, since no sound could be heard in the corridor. Family presence was not noticed in the single-bed area during the observation sessions.

The entry doors of all single-bed patient rooms were open, allowing greater visibility for staff, and also allowing patients to be aware of people passing in the corridor (about a person passing each minute, on average). Standing in the corridor, the author could hear conversations in the patient room, even discerning some words. All single-bed patient rooms have windows to the corridor. In some rooms the window blinds were up and in other rooms the blinds were down. Disinfecting hand gel is located outside each patient room door, and staff often used the gel when entering and exiting the room.

Figure 33 - Kungälv ICU - Behavioral Mapping Session of Single-bed area, recording movements and interactions of one nurse (light blue) and of all others (dark blue).



The raised glass observation station offers an effective view to the patient rooms (4 of 5) via a window. The observation room offered staff a place to converse, monitor, and document/chart. The use of the observation room fluctuated, but was utilized to some degree during all three sessions observing the single-bed room area.

Double-bed area

In the double-bed room area, types of activities and movement patterns differed significantly from the single-bed area. In the double-bed area, patients were often on ventilators, sometimes sedated, and often not able to communicate well. During the 4 observation sessions, the patient beds were rotated so the patient faces toward the observation room. On other visits it was noticed that some lower-acuity patients were rotated to face toward the exterior window.

Compared to the NÄL ICU or the Kungälv single-bed area, the double-bed area has a higher level of people movement and interaction. Staff more hoften work together. Common tasks include direct patient care, interacting with computers or equipment, and interacting with other staff members. In addition to utilizing digital medical documentation, staff also often utilized paper records, working on a table at the foot of the patient bed.

In one session a patient had several family members present. The ceiling pendant systems were not noticed to be moved during the observation sessions. The mobile screens were moved often in response to changing care activities.

Figure 34 - Kungälv ICU - Behavioral Mapping Session, 16:45-17:00

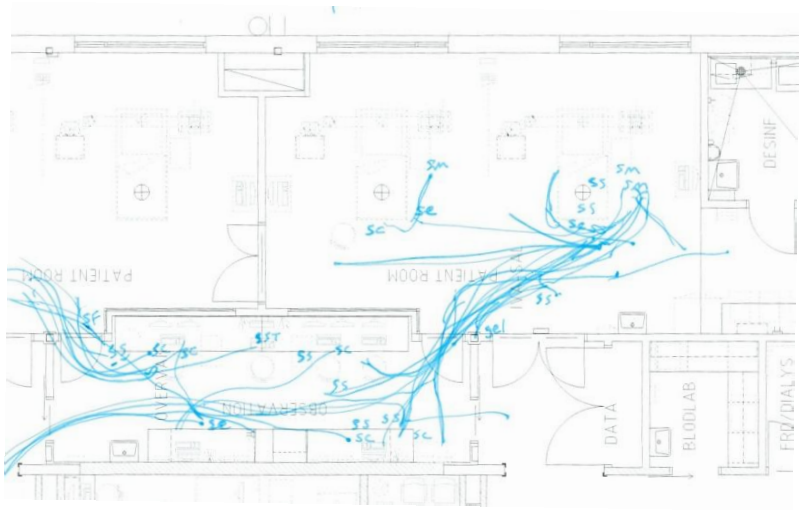
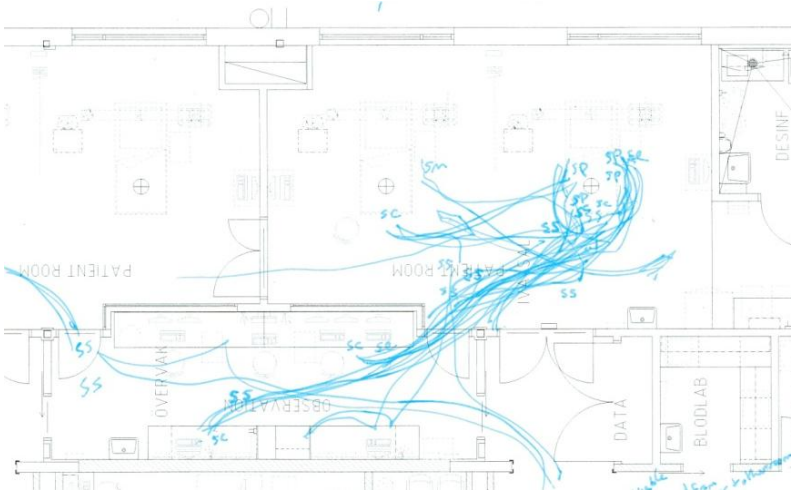


Figure 35 - Kungälv ICU - Behavioral Mapping Session, 17:00-17:15



The documentation/observation workroom was used often: for medication preparation, patient documentation, and staff conversations. Staff go in and out of the workroom often to access medications and supplies. A monitoring screen in the workroom showed physiological graphs of all four patients, but it was rare that staff viewed the monitor in the workroom.

The workroom provided a high level of visibility of the patient rooms. Since the door from the workroom to the patient room was usually held-open, conversations in the workroom could often be heard in the patient room. In some occasions when the door was closed, no sound at all could be heard passing between the workroom and the patient room. No noise was noticed coming from the main corridor into the workroom.

Interviews, Questionnaires, and Open-Input Poster

Overall unit

In general the new unit is meeting the goals and expectations of staff members. Most are pleased with the color scheme of the unit, one even calling it "very beautiful". Staff rotate on shifts between the double-bed area, the single-bed area, and post-op, which gives an interesting variety in work environment and type of patient.

Compared to the previous unit with 7 beds along one single corridor, several comments stated that the new unit feels more spread out and requires longer walking distances. In the new unit, the single-bed area and the double-bed area function as separate areas, and the level of awareness and interaction between the two areas is relatively low. One person commented that the nurse managers are farther away compared to the previous unit with a more centrally located office. Another person commented that certain spaces did not need to be located centrally (bereavement room, some storage rooms and some offices), and cause "extended and unnecessarily long distances." There could be a benefit from locating some of these rooms more peripherally.

Single-bed rooms and monitoring/documentation room

The single-bed room area functions more as an Intermediate Care Unit or a regular ward, and patients are not on ventilators. Staff go in and out of the patient room more often, and have less time in the patient room than in the double-bed rooms where patients are of higher acuity. Staff go across the hall to access medications. Staff assistance is accessed by using the nurse call button or by stepping out into the hallway to find a colleague. The questionnaire results show that staff feel the single-bed rooms gives less effective patient observation and less staff collaboration, compared to the double-bed rooms. However, single-bed rooms were rated higher for patient privacy and ability to converse privately with families.

Some staff commented that the single-bed rooms were fresh and had an attractive color palette, however there was a desire to have alternatives to conventional fluorescent lighting, such as dimmable spotlights or an "uplight" on the wall behind the bed. One person stated an appreciation for having an exterior window at the patient's side. Another person disliked that the main view of the window is the "white wall" of another building 10m away.

Figure 36 - Kungälv ICU - Single-bed room, showing room décor and window view

Across the hall from the single-bed rooms is a monitoring/ documentation room. The room is essentially a glass box, and is elevated 2 steps up, allowing a direct view into 4 of the 5 single-bed rooms. Visibility of the window between the patient room and the corridor can be controlled via a roller shade. When doing documentation in the patient room, staff can use paper records or can bring in a computer on a mobile cart. The documentation room is also used for reporting at shift change.

Double-bed rooms

The double-bed patient rooms are used for patients of higher acuity. Most patients are on ventilators. The model-of-care includes having a nurse or assistant nurse present in the room all the time. Two staff members stated that they preferred to work in the double-bed area, not necessarily due to the room environment, but because they preferred to work with higher acuity patients and have more time directly with the patient.

Getting assistance from other staff is usually simple as there is often already another staff member in the room. Otherwise, staff are often present in the adjacent patient room or in the documentation workroom, and can be seen through windows.

Staff appreciate that the ceiling pendant systems allow the bed to be rotated, give more work space, and keep things off the floor. Staff also generally liked the ambience of the room, such as the color scheme and the decorative mosaic wall tile. One staff member expressed dislike for the yellow floor color, while another staff member appreciated it.

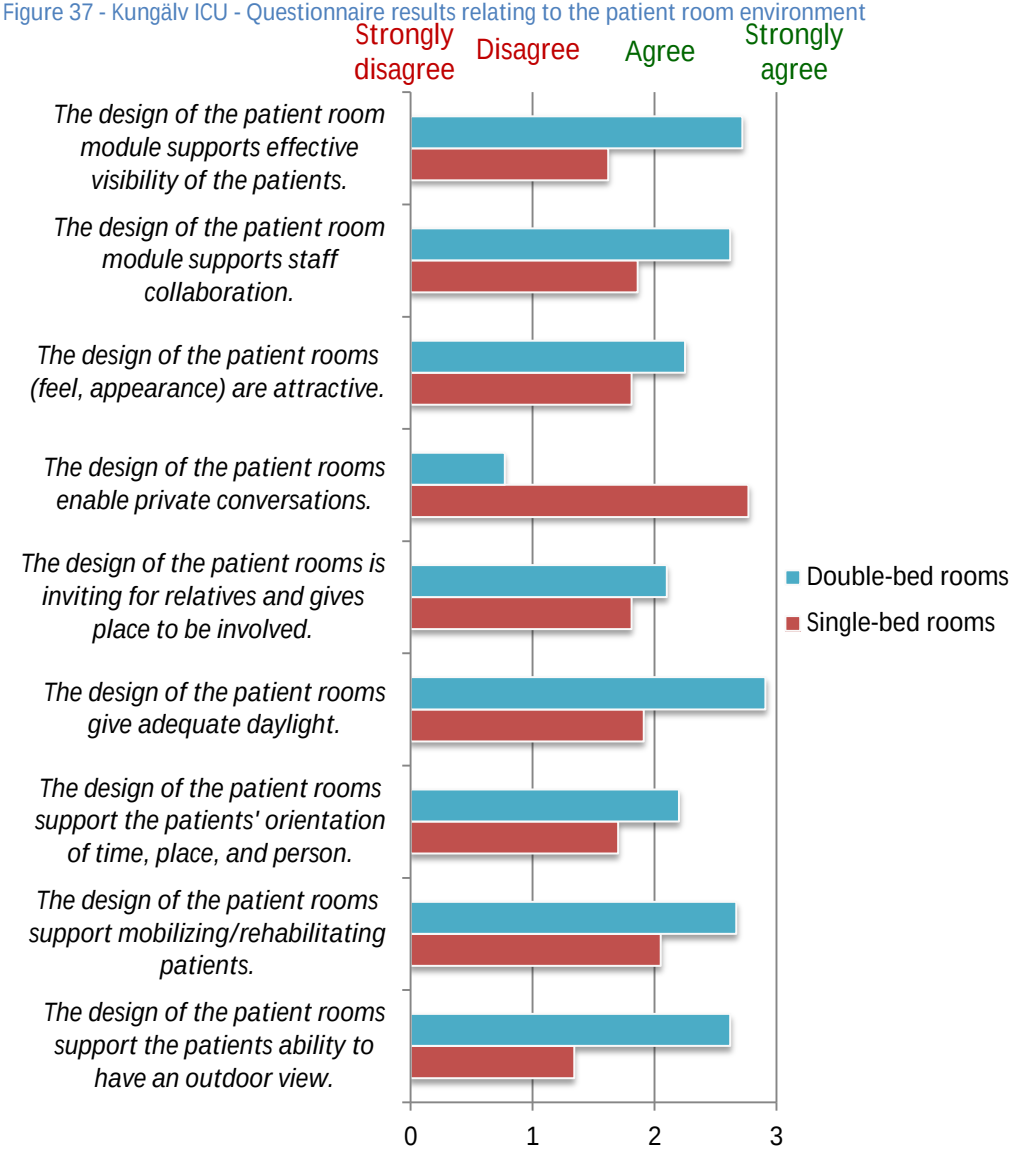
One goal of the design was to create a place where the patient can be reminded that there is still a world outside the hospital: big windows, operable windows, ability to rotate the patient bed, ability to view TV (with a headset), and the ability to use personal electronic devices. There was a desire to allow patients to go outside, such as on a balcony, but it was not possible. Staff comments describe that the room is supportive of rotating the patient bed to allow a view out or to watch TV. There is also sufficient space in the room for some patients to attempt to get out of bed into a specialized rehabilitation chair.

Staff responded very positively to the large exterior windows and the natural light, with comments such as “fantastic window” and “I like the natural light!” However, some staff expressed concern about privacy – the unit is located one storey above ground and people passing by outside may be able to look in. The design does allow flexibility in options for covering the window, including exterior blinds and an interior

moveable screen/partition. These may be used in certain situations, such as during patient cleaning/hygiene.

Patient privacy within the room is provided via mobile screens (partitions) between patient beds. Staff viewed the screens as being easy to clean, to move, and to extend, and that the screens adequately prevented patients from seeing each other. One staff member commented that most patients do not mind being overheard, but other comments expressed difficulty in maintaining patient privacy and confidentiality. In the questionnaire, staff generally felt that the double-bed room did not enable private conversations.

Figure 37 - Kungälv ICU - Questionnaire results relating to the patient room environment



Double-bed monitoring/documentation workroom

The room adjacent to the two double-bed rooms is used for medication preparation, patient monitoring and documentation, and staff conversations. The module of patient rooms and adjacent workroom is therefore largely self-sufficient. Staff appreciated the convenience of having medication available nearby, and that the patient room could be kept quieter. One comment expressed interest in preparing medication in the patient room in order to remain closer to the patient.

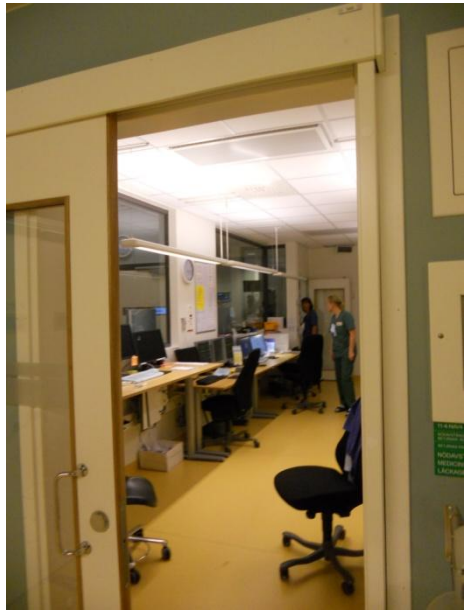


Figure 38 - Kungälv ICU - Double-bed area documentation workroom

The documentation workroom is a place of extensive staff collaboration, at the same time allowing an awareness of staff and patient activities in each of the double-bed rooms. The design of the module layout is intend to keep the noisier environment in the documentation workroom and a quieter environment in the patient room. Staff do attempt to perform noisier activities and conversations in the workroom rather than the patient room. However, the doors between the workroom and the patient rooms are held open most of the time. One person told a story about a time when six staff members were conversing in the workroom, and she in the patient room could hear everything they were saying.

Several staff members expressed concern that the large windows in the documentation workroom make patients feel exposed, as in an "aquarium". The large windows in the documentation workroom also make it challenging to reduce light entering the patient room at night, disturbing patient sleep.

Between the two double-bed rooms there is a connecting door to pass between rooms, which staff view as helpful to go back and forth to help each other.

Family involvement

When staff were asked how the patient rooms could be more supportive of family involvement, the most common responses were regarding chairs and single-bed rooms. Chairs could be more comfortable and a greater number of chairs could be available. Several comments were made that single-bed rooms are better for family involvement since privacy is greatly increased and there are less disturbances. For example, family members must leave the room when the neighboring patient is being washed, having a procedure, or near end-of-life. One staff member commented that in some cases curious family members have tried to peek over the mobile screens to look at the other patient. Another person commented that family involvement has less to with the room, and more to do with staff-family communication and staff readiness to collaborate with families. There is a unit policy limiting two visitors per patient.

Staff were generally positive about the presence of the family rooms and felt like they were used regularly. Family beds were acknowledged to be

used often, and the mini apartment just outside the unit is useful for whole families visiting and for persons coming from a long distance. The small family room directly next to the double-bed patient room was said to be useful to give emotional families close proximity to their loved one.

One person commented that there is a shortage of toilets in the unit. There is a code on the door to the staff toilet so that family members do not use it.

For a patient near end-of-life, if the patient is in a double-bed room and the other patient is awake/alert, then the terminal patient may be moved to a single-bed room. However, when a patient is nearing end-of-life then even just a transfer to another room can be life threatening. There is a bereavement room in the unit. Staff appreciated the close location compared to the previously long and unpleasant trip to the bereavement room in another department downstairs.

Figure 39 - Kungälv ICU - From left: family room, staff workroom, and patient room

Overview of results at Kungälv ICU

The significant differences in the design of the single-bed area and of the double-bed area seem to be adequately supporting the care needs of their respective patient acuity levels. For example, levels of observation and staff collaboration are greater in the double-room area. In both areas, the presence of patient room doors being open most of the time may cause excessive noise in the patient room. Similarly, having a window into the patient room and having a door open may cause concerns for privacy.

Staff were very positive about the large exterior windows in the double-bed patient rooms. In the single-bed patient rooms, some staff felt like the patients had an adequate view of the window, but that the outdoor view was poor, and daylight levels were lower than in the double-bed room.

The documentation/medication workroom in the double-bed area is an effective place for staff collaboration and activity, but it is unclear the effect of this room on the patient, in terms of noise, light, and reduced privacy. The impacts of performing medication preparation in the workroom are also unclear, as there are benefits to keeping the patient room quiet, but there is greater potential for distraction in the busy workroom.

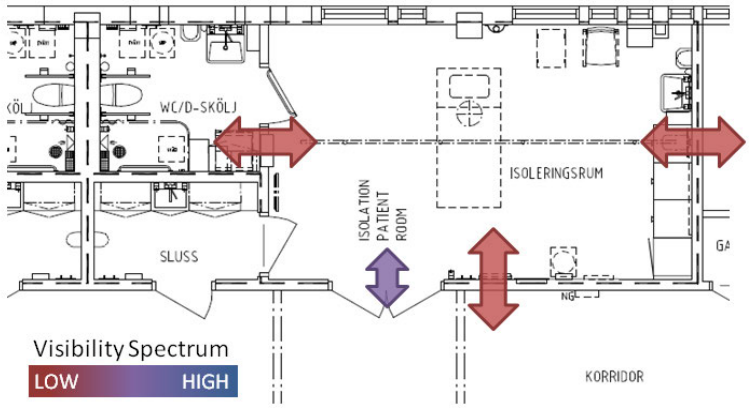
Several people stated that single-bed patient rooms could be better for family involvement by improving privacy and by reducing disturbances.

11. Results at Mölndal ICU

Plan Analysis

The layout and location of the single-bed rooms is quite similar to the unit's previous single-bed rooms. The size is increased from 19m² to 27m², meeting Swedish guidelines (SFVH 2010; Gustafsson 2012). The room depth dimension is 4m, which is smaller than recommended by Gustafsson or by Hamilton and Shepley (2010). The single-bed patient room modules do not include a designated space outside the room for documentation or monitoring. The level of visibility from the corridor to the patient room is low.

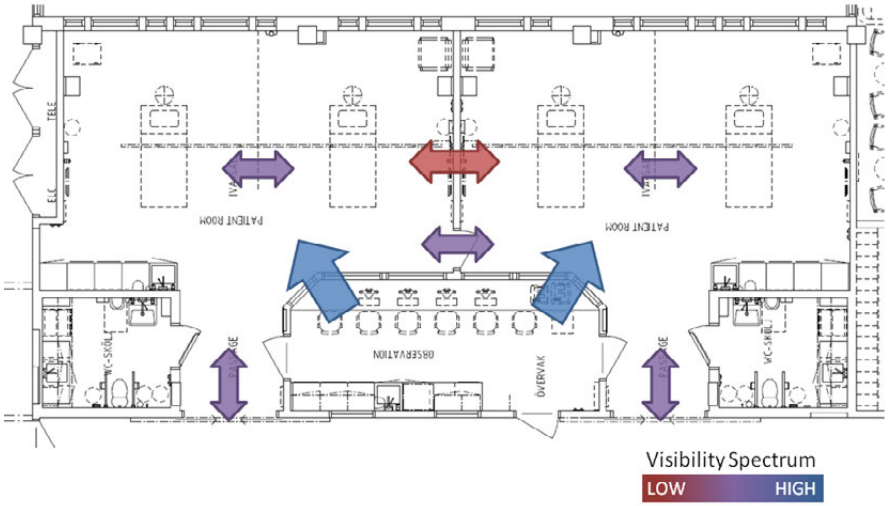
Figure 40 - Mölndal ICU - Visibility in the single-bed rooms



The size of the double-bed rooms at 23m² complies with Swedish guidelines (SFVH 2010), however the width of a patient place at 4,3m is less than the 4,6m recommended by Gustaffsson (2012). The layout of the double-bed room module is very similar to that at Kungälv ICU.

Both the single and double-bed rooms have relatively convenient access to medication storage, with a walking distance ranging from 9-18 meters.

Figure 41 - Mölndal ICU - Visibility in the double-bed room module



Interview, Walk-Through Tour, and Questionnaires

Overall unit

In general, staff were positive about the design of the unit, stating examples such as having sufficient space around the patient and having a quieter environment than the previous unit (which had several beds in Post-op). Staff appreciated that the rooms are have modern equipment such as pendant systems and ceiling lifts. These items are utilized, for example when moving a patient or when a patient's acuity level changes.

One person commented that on nights and weekend (when there are less staff) staff feel spread out and it is challenging to cover the size of the department. Three persons specifically commented that the temperature of the rooms feels too cold.

Similar to Kungälv ICU, the unit features a variety of patient bed types: single-bed isolation rooms, double-bed ICU rooms, and a post-op area with multiple beds per room. Staff appreciated the flexibility and the ability to assign patients to the most appropriate type of space. For example, for some patients who are physically and/or psychologically unstable (e.g. intoxicated or high), a bed in the post-op area may be assigned. Then, if violent behavior occurs, the nurse is safer with a larger space (i.e. not trapped in an enclosed room).

The questionnaire results strongly disagreed that the single-bed rooms or the double-bed room supports a patient's ability to have an outdoor view, and mildly disagreed that the room gives adequate daylight. Each room has the ability to rotate the patient bed to allow a view of the window. However, the windows face toward an enclosed courtyard, and the predominant view is of a wall (6m away in the double room and 14m away in the single room).

Single-bed rooms

In general staff view the single bed rooms as providing improved privacy and infection control, but causing a major hindrance to nurse collaboration. There is no window between the patient room and the corridor. More staff per patient are required than in the double-bed room, and as a result the single-bed rooms are utilized less often.

Several staff commented that the single-bed patient room was too narrow. There is not enough space at the foot of the bed and it can be difficult to walk around.

Double-bed rooms

The layout of the double-bed patient room module is very similar to that in Kungälv ICU. Questionnaire results at both units strongly agreed that the module layout supports staff collaboration and effective visibility of patients. At both units the questionnaire asked if the patient room enables private conversations, and staff strongly disagreed. However, one staff member at Mölndal ICU suggested that family/patient privacy in the double rooms does not seem to be a major issue. This suggests that the perceptions of staff, patients, and families should be investigated further.

Cabinets in the patient room are used to store supplies for patient hygiene. Medical supplies are stored and prepared in the adjacent documentation workroom to help create a quieter patient room environment.

Family involvement

In general staff felt like the patient rooms were supportive of family involvement, however several people commented that family could benefit from having more space or a more “dedicated” space, such as hooks for hanging clothing or chairs designated for family use. Some persons commented that patient rooms were too small for family to stay in the room during care activities. It was acknowledged that the double-bed rooms had a lack of privacy and it is easy to disturb a neighboring patient.

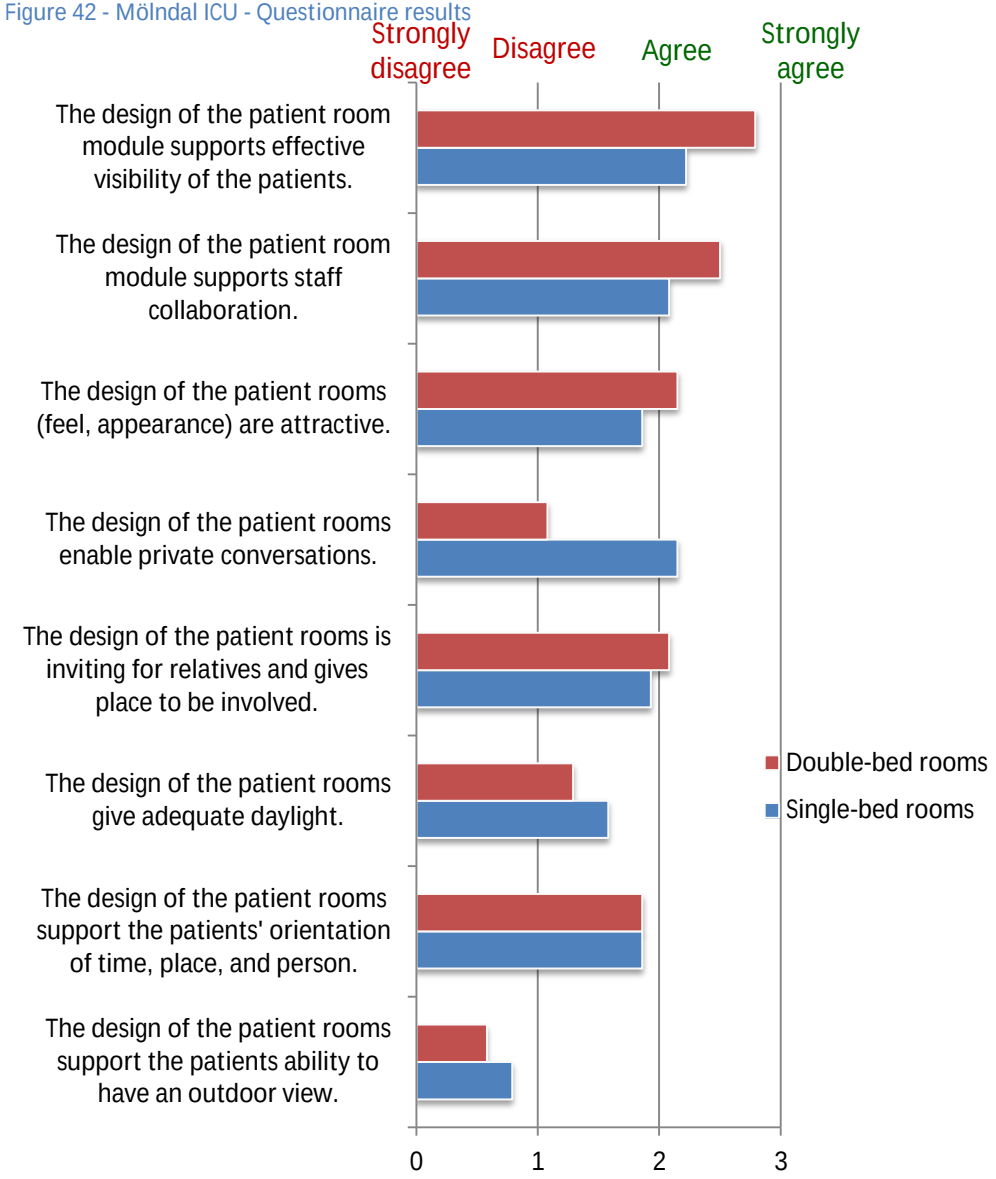
Overview of Results at Mölndal ICU

The results at Mölndal ICU confirm that a large patient room size is not always sufficient if the proportion of the room is too narrow.

The results are also very strong in suggesting that the effectiveness of an exterior window is not fully achieved when the outdoor context is primarily of the built environment (for example compared to a nature view).

Staff collaboration and observation effectiveness is noted to be better at double-bed rooms. As a result, the model-of-care is adapted at single-bed rooms to utilize more staff.

Figure 42 - Mölndal ICU - Questionnaire results



12. Discussion of Results

It is clear from the evaluation that different design strategies have a different affect on outcomes in intensive care units – including personal responses and feelings of individual staff members, as well as responses and adaptations made by organizations as a whole. This section discusses the results of the study, compares outcomes at different units, and reflects on the effectiveness of the design strategies to achieve certain outcomes.

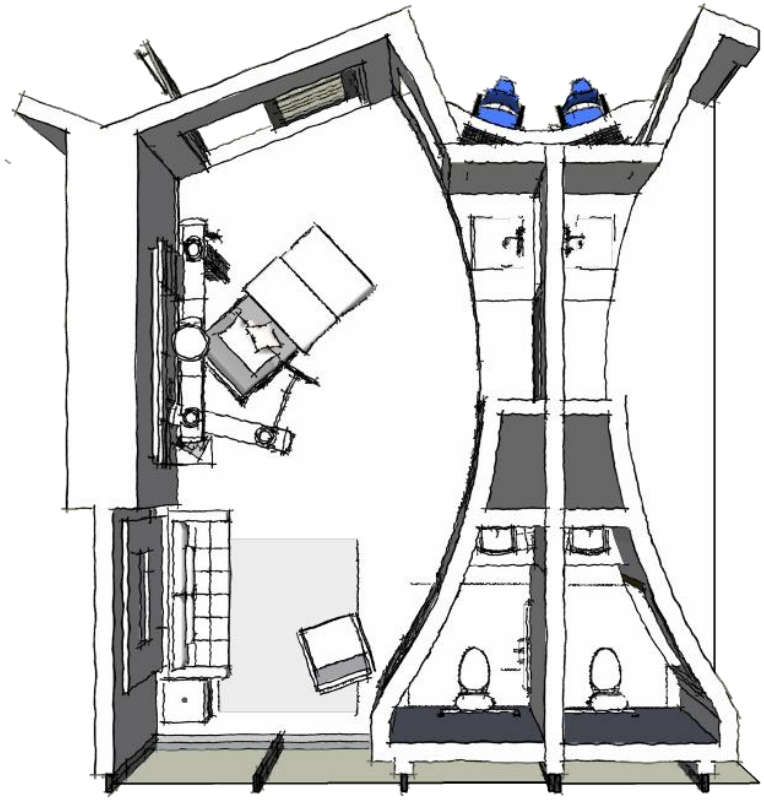
This study is placed on the middle of the spectrum of design rigor, and as a result, not all variables are controlled. It is not always clear which strategy or strategies most significantly affect an outcome. Alternatively, a "bundle" of design strategies (Hamilton 2012) can be grouped together with a common purpose, and together as a whole, the strategies have an integrated and more effective outcome than they may have had individually.

Family involvement

All projects had a goal to increase the amount of family involvement in the unit.
Strategies used included:

- Larger patient room sizes
- Single-bed rooms
- A chair or two available in the patient room
- Family respite rooms available in the unit
- Family sleeping rooms available in/near the unit
- More open policies toward family visitation

Figure 43 - An Intensive Care Patient Room with designated space for family involvement, and opportunity to stay overnight (Atkinson and Suarez 2008)

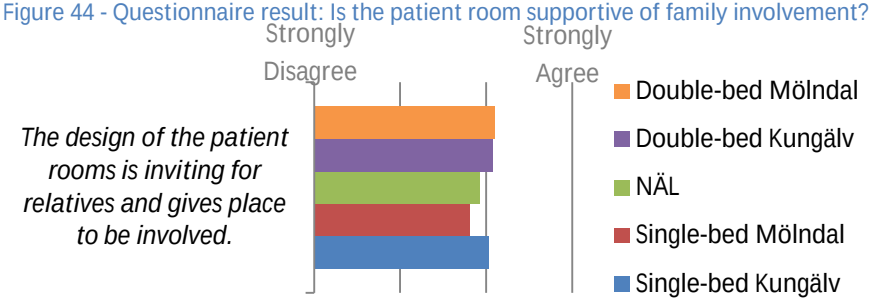


Observations suggest that frequency of family involvement was greater at NÄL ICU than at Kungälv ICU. For example, at the former unit, family presence was noted in 4 of 10 rooms, and the latter instance in 1 of 7 rooms. Further, all of the three family sleeping rooms at NÄL were occupied during the author's visit, and other family members were also present in the "living room". These observations were performed on a limited scale and require further validation.

The noted strategies strongly work in tandem together. Most significantly, single-bed rooms provide an environment of increased privacy, while also encouraging family space in the room and more open visitation policies. At Kungälv ICU with predominantly double-bed rooms there was a limit to two visitors per patient, while at NÄL ICU with single-bed rooms there was no limit. Regardless of whether more than two family members at a time actually do visit a patient or not, the policy portrays an attitude which can affect the willingness and motivation of family members to be involved in the care process.

In contrast to the observations, the questionnaires showed that staff perceptions at each unit are relatively similar regarding how the room design supports family involvement.

Figure 44 - Questionnaire result: Is the patient room supportive of family involvement?



There could be several reasons for these responses. At Kungälv ICU the single-bed patient rooms are smaller in size, and at Mölndal ICU staff commented that the single-bed patient room proportion causes the space to feel crowded. These concerns about the room size may cause staff to feel that the rooms are less supportive of family involvement. At NÄL more than at other units, staff were concerned that the atmosphere and ambience of the room was not as pleasant as it could be, which could be seen to detrimentally affect family involvement.

There were several suggestions made for increasing family involvement, such as providing more comfortable chairs in the patient room, providing a means of storing personal items, and providing an opportunity for a family member to stay overnight in the patient room, such as in Figure 43 above.

Interestingly, the observations noted in section nine (Figure 20, page 25) suggest that an increase in family involvement correlates with an increase in patient interaction and a decrease in interaction with equipment or computers. This suggests that family presence affects the timing and type of staff tasks. For example, presence of a family member could likely result in staff-family interaction, which could then cause other care-related tasks to be postponed. Increased interaction with family could also potentially reduce staff feelings of isolation and loneliness when working in an enclosed module.

Figure 45 - Kungälv ICU - The wall tile mosaic is an appreciated feature

Ambience / atmosphere of the patient room

Several staff made comments that the environment appeared bland or sterile. There were no comments made stating that the environment was excessively stimulating. Specifically, highly valued features included use of color, artistic materials, and large outdoor views.

Through observations, the author realized that the style of interior design was dramatically different in the staff and family areas than in the patient areas. Staff and family areas tended to have a more home-like feel: the use of attractive colors, patterns, natural materials, and soft decorative lighting. The patient room in comparison often felt monochrome and bland. The significant presence of technical equipment also alters the ambience of the environment. Still, patient environments could potentially benefit from borrowing some of the design strategies used in family and staff areas.

Figure 46 - Kungälv ICU - Staff Lounge ("fikarum")

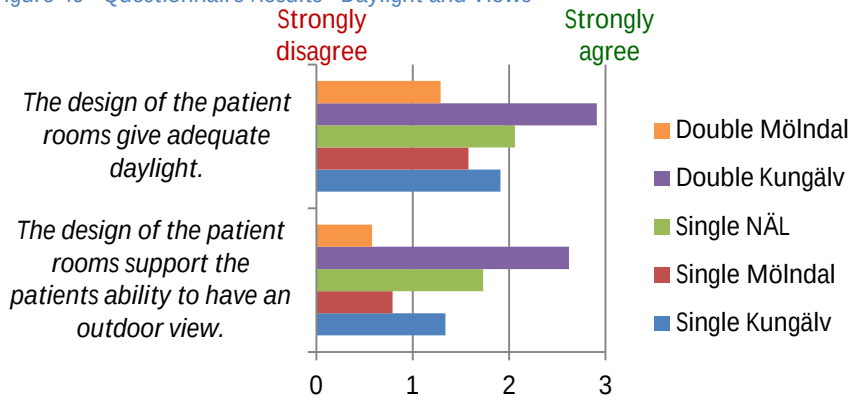
Figure 47 - NÄL ICU - Staff Lounge

Figure 48 - NÄL ICU - Patient Room

Exterior doors and windows

The value of exterior windows (and doors) was widely acknowledged, but a variety of factors influenced their usefulness.

Figure 49 - Questionnaire Results - Daylight and Views



The questionnaire results show that the large windows in the double-bed patient room at Kungälv ICU have a much higher level of satisfaction with daylight and views than other units. Further, the windows have a low sill height to more easily facilitate a view from a bedridden patient. In most units, the daylight and views can be effectively controlled by means such as mobile screens, interior blinds, or exterior blinds. However, several staff still expressed concerns about privacy (views in from the outside).

At Mölndal ICU the low results in the questionnaire were explained further in the open comments, for example that windows were small and/or the view was predominantly of a nearby building (a courtyard). At NÄL ICU, the effectiveness of the daylight and views provided by windows was hindered by the use of frosted glass and/or nearby bushes.

Figure 50 - Kungälv ICU – Double-bed patient room. Large exterior windows are centered on the patient space. The mobile screen (on left) and blinds help to control the view. (Ek 2012c)

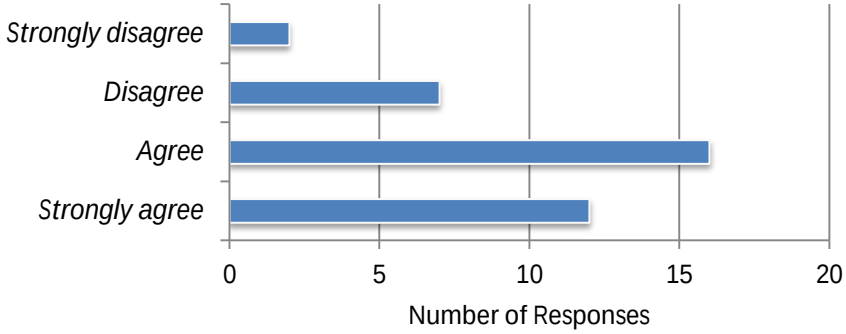
Figure 51 - Kungälv ICU – Single-bed patient room. Patients are able to see through windows, but factors such as window size, height, and location affect the view.

Figure 52 - Kungälv ICU - Exterior window blinds at the adjacent Surgery unit

Operable windows were greatly appreciated, and the author's observations confirmed their frequency of use. Patients are sometimes able to initiate the request to open a window, or staff may do so. The ability to have control and the feelings of fresh outdoor air are likely to promote positive emotional and psychological responses.

NÄL ICU is the sole unit with exterior doors. The two isolation rooms actually allow a bedridden patient to be taken outside, while other doors allow a patient to be placed in front of the open door. While most staff responded that the doors were valuable, many also commented that the doors were not often utilized. For specific comments, refer to the section *Fresh air and outdoor access* on page 33.

NÄL ICU: Having a door to the outside of the building is an important part of the room's design.



Noise

All projects had a goal of reducing noise in the unit. The most common strategy was to incorporate sound-absorbing surfaces, such as ceiling tiles. This evaluation study did not systematically measure noise, but several comments were made by staff since it is an important issue. In general staff at NÄL were satisfied with noise levels and noted improvements compared to other ICU environments. Staff also noted that a room is never completely quiet due to the constant hum of equipment. Further, alarms may sound more frequently or loudly than desired. From the author's own observations, rooms were generally quiet, but conversations could be overhead in adjacent rooms, and sometimes alarms sounded frequently and/or were not responded to quickly.

Disinfection/toilet/utility room

The function of this room was not a focus in the evaluation study, but it is an important part of a patient room module, so some comments and observations were noted. General consensus seems to be that a toilet is not needed in an ICU patient room because such high acuity patients rarely can use the toilet. More often, a patient utilizes a bedpan, a mobile toilet, or an indwelling bowel catheter. All of these tasks can benefit from having a disinfection/utility room in close proximity in order to decrease walking distance. To reduce chance of spreading infection, ideally a disinfection room will be provided for each patient room.

Some reasons to potentially include a toilet in the patient room module include planning for the future (changing acuity levels or changing building functions) or to provide a place for family use.

Cultural impacts

Both a local organizational culture and a national Swedish culture were seen to have affects on the design strategies used, and to some degree on outcomes. For example, in many countries it is possible that designers place an importance on daylight, nature views, and outdoor access, but these values are of greater importance in Swedish culture than many others. As a result design strategies such as very large windows (Kungälv) or outdoor access (NÄL) are implemented. Similar comments could be made regarding staff lounges, which are generally quite large, pleasant in design, and well-utilized, since "fika" is an important cultural element. The low utilization of outdoor access at NÄL could be a case of attempting to implement a cultural value, but difficulty in applying it in an unconventional setting.

Figure 53 - Kalmar ICU - Staff Lounge ("Fikarum") (Ek 2012d)

Staffing models are another example of a cultural element. Each country (and sometimes each organization) applies health care in culturally specific ways. In Sweden characteristics of intensive care include having close, personal, and attentive care and relatively high staffing ratios. In contrast, in some cultures (e.g. U.S) there are organizations going to the other end of the spectrum and have remote monitoring "e-ICU" care from a completely different building site. (Hamilton and Shepley 2010) Such differences are reflected in models of care, such as a more intimate staffing ratio of 2:2 in Sweden and a ratio more commonly 1:2 in the U.S. These factors are important considerations to take into account when designing and evaluating facilities, as a design strategy may be appropriate in one cultural setting but not another.

Staffing

The number of staff working in a unit and the closeness of care provided is a good example of a national cultural issue, and also a local cultural issue. In both cases, values are shifting. As a whole, Swedish intensive care is shifting toward higher proportions of single-bed rooms, which will have a significant impact on the model of care. The ICU at NÄL is a prime example of this cultural and organizational shift, in which staff needed to learn how to adapt to a new way of working. Even now, two years after occupancy, many staff still have a mindset of missing some aspects of the previous model of care. For example, many comments were made regarding loneliness and access to help, which were not significant issues in the previous design and previous models of care.

It is interesting to note that in a general sense the NÄL ICU and the Kungälv ICU both share the same basic staffing ratio of 2:2. However, the NÄL ICU has a slightly larger number of nurse coordinators/circulators, as a strategy to provide help quickly and effectively to nurses isolated working inside a single-bed patient room. In a study by Hendrich *et. al.* (2004) a new facility with single-bed rooms was evaluated, and nursing staff numbers were found to have increased for the first year after occupancy, but decreased thereafter.

An interesting example of unit adaptability over a longer time and changing staffing ratios is found at Kungälv ICU. The single-bed room area, previously used for general ICU patients, is now used for lesser acuity ICU patients, for which lesser staffing ratios can be applied. While in some other examples such spaces may be neglected or entirely replaced, the Kungälv example is a creative and efficient method of reusing space.

Single-bed rooms and the room-connecting sliding door

The use of single-bed rooms was generally found to be supportive of increased family involvement, improved privacy, and reduced noise. Further, significant operational benefits can be gained by having higher utilization rates compared to multi-bed rooms, and the ability to have procedures performed in the room can reduce costly patient transfers. (R. S. Ulrich 2011) However, single-bed rooms can reduce staff interaction and collaboration, which will be discussed in a next section.

A key factor that allows such a traditional staffing ratio at the new design typology at NÄL is the innovative use of the sliding door connecting two patient rooms together. In a sense then, the "single-bed room" functions as a "double-bed room" in most practical aspects. In particular, an open sliding door enables the nurse to be stationed in the center between both rooms, with an ability of visual and auditory observation. Further, a quick response is enabled since the open sliding door minimizes the nurse

needing to pass through any other doors or intermediate spaces in order to reach a patient.

Figure 54 - NÄL ICU - Sliding Door Between Patient Rooms (Ek 2012e)

However, this “hybrid” design of a single-bed patient room may or may not achieve the full benefits of a true single-bed room. Many benefits of a single-bed room have been clearly documented. For obtaining some of these benefits, such as enhanced dignity in end-of-life, reduced room transfers, and reduced noise, the sliding door can be closed when a situation presents itself.

For example, if noise levels increase due to family presence or medical rounds, then the sliding door can be closed, and the patient (or the neighboring patient) can benefit from the environment of a single-bed room. However, other situations are less clear, or are constantly changing. For example, normal conversations occur during the course of care, and sometimes they may be overly loud. The decibel level may fluctuate often over time, but the staff may not notice the fluctuation in noise or may not be able to respond. As a result, the sliding door might not be closed, and the neighboring patient would not reap the full benefits of a quiet single-bed room.

Other situations are similarly difficult to ascertain. Single-bed rooms are reported to reduce medical errors. One reason for this is due to the reduced distractions in a single-patient room. If the sliding door is open, allowing some noise to pass through, or a nurse is working in one room while keeping an eye on the other room, then potentially this particular benefit of a single-bed room could be lost.

Single-bed rooms are also reported to reduce hospital-acquired infections. Ulrich states several reasons why single-bed rooms are beneficial in reducing infection (R. S. Ulrich 2007a, R. S. Ulrich 2007b;):

1. Enhanced ability to clean a room after a patient goes home
2. Reduced spread of aerosol and droplet based infections
3. Improved control of airflow and air quality
4. The ability to separate patients as soon as they are admitted to the hospital, preventing the spread of yet undetected infections
5. Hand-washing sinks in more carefully placed locations, to encourage higher rates of hand washing
6. Private toilets [or disinfection rooms] contain the outbreak of an infection

In a "hybrid" room with a sliding door these same benefits may or may not be achieved, particularly if the sliding door is left open most of the time. For example, if the door is left open, then airborne, aerosol, and droplet-based infections could be more likely to pass between rooms.

A recent study of an intensive care unit in Canada converted to single-bed rooms showed lower rates of many types of infections with the new design, yet it was not stated which specific aspects of the environment caused the positive outcome. (Teltsch et al. 2011) Rather, the reduced infection rates were attributed to the single-bed room in general, as a type of "design bundle" of features working together. The study states that one of the main reasons for the reduction in infection is in the way a single-bed room assists in improving infection control practices, such as hand hygiene.

Keeping hands clean is one of the most important strategies for reducing the spread of infection in healthcare, and best practice requires persons to perform hand hygiene (i.e. wash hands or utilize disinfecting gel) before and after performing care or making contact with a patient. Despite good intentions to clean hands in every circumstance, human behavior is by nature imperfect. A Dutch report in 2009 reviewed 96 empirical studies on compliance with hand hygiene guidelines, and found a median compliance rate of 40%. (Erasmus et al. 2010) Compliance rates in intensive care settings were lower than in other settings. Common strategies to increase hand hygiene include staff education, reminder signs, room design, and convenient location of sinks and gel dispensers.

In a single-bed room, when a staff member goes from one patient to another, the staff member must open a door, pass through a corridor, and enter a new room before meeting the next patient. This brief but important transition process may serve as a formal moment subconsciously reminding of hand hygiene. In contrast, when multiple patients are in one room (or with a sliding door kept open), a staff member can conveniently and quickly pass from one patient to another, without opening a door. This potentially creates a higher mental load for staff to remember hand hygiene each time.

To summarize, the sliding door between patient rooms has great potential to increase observation capacity, reduce staff walking distances, and increase staff efficiency. Other affects and outcomes of a design utilizing a sliding door should be studied further, such as noise and infection acquisition rates.

Patient monitoring and charting/documentation

Most staff preferred to be in the patient room when monitoring a patient's physiological vital signs. Screens are usually available mounted on a pendant to the side of the patient's head, and monitors and alarms can be reviewed while in close proximity to the patient.

Charting can essentially be performed wherever there is a computer. At Kungälv ICU double-bed area, charting could be done on paper at the foot of a patient bed, on a computer mounted to a wall in the patient room, or in the adjacent observation workroom. In the single-bed area, a computer on a mobile cart could be brought into the room. At NÄL ICU, charting could be done on a computer in the patient room (mounted to a pendant), or could be done in the adjacent monitoring/charting station.

Figure 55 - NÄL ICU - Charting (left) and monitoring (right) while close to the patient.

Staff may opt to chart in the patient room for the same reasons as for preferring to monitor in the patient room. Charting in the separate adjacent room can give a more focused and quiet environment and/or can provide an environment conducive to verbally discussing the information with a colleague. However, some staff were reluctant to perform charting or monitoring in the separate adjacent room, because they preferred to be physically, visually and audibly closer to the patient.

With ever-progressing technological advances, the methods of charting and monitoring have changed dramatically in recent years. For example, a change of whole healthcare organizations from using paper charts to using digital charts and documentation. It appears useful to have charting and monitoring available in several places as a strategy to allow flexibility in work styles and models of care. Taking the idea further, as equipment becomes increasingly wireless, it is even possible to question the concept of having a dedicated space for these specific functions.

Patient module relationships

At NÄL ICU, a patient room module consists of two patient rooms, an observation/monitoring/charting room, and a disinfection/utility room. At Kungälv and Mölndal ICUs, the double-bed room modules consist of two patient rooms, a observation/charting/medication station, and two disinfection rooms. In essence then, the components of the module are similar. The difference lies in the size of the modules – Kungälv and Mölndal ICUs have larger modules, for four patients each, and a correspondingly larger charting station also.

One area without consensus is the location of medicine preparation. In some facilities it can be done in the patient room, in some facilities in the adjacent charting/medication station, and in some facilities in a separate medication room.

There has been some concern with the placement of medication preparation activities in the charting/observation room, since it is a busy and noisier environment and could contribute to increased medical errors. Having medicine preparation performed in the patient room enhances efficiency of proximity, but there is some concern regarding the amount of noise created in the patient room. Placing medication preparation activities decentralized in the patient room could necessitate an altered supply distribution methodology.

The concept of grouping two rooms together into a module appears to be effective. The common joint between the rooms provides an excellent

viewpoint to observe both rooms simultaneously. There is a variety of different ways in which the components of the module can be oriented and connected. For example, the module at Kungälv ICU has different connection locations (door locations) than the module at NÄL ICU. The resulting staff movements, flows, and interactions are unique. (see Figures Figure 56and Figure 57)

Figure 56 - NÄL ICU Module - Primary flows are around the patient, secondary flows are between rooms, and tertiary flows are through the patient room entry door.

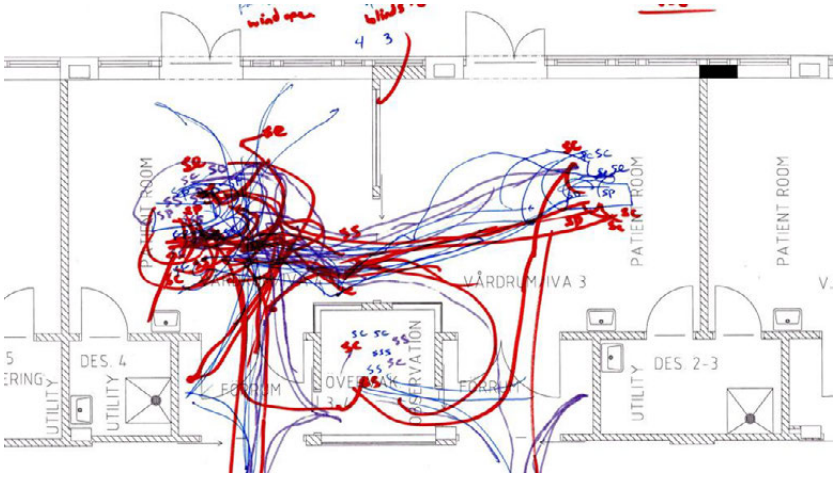
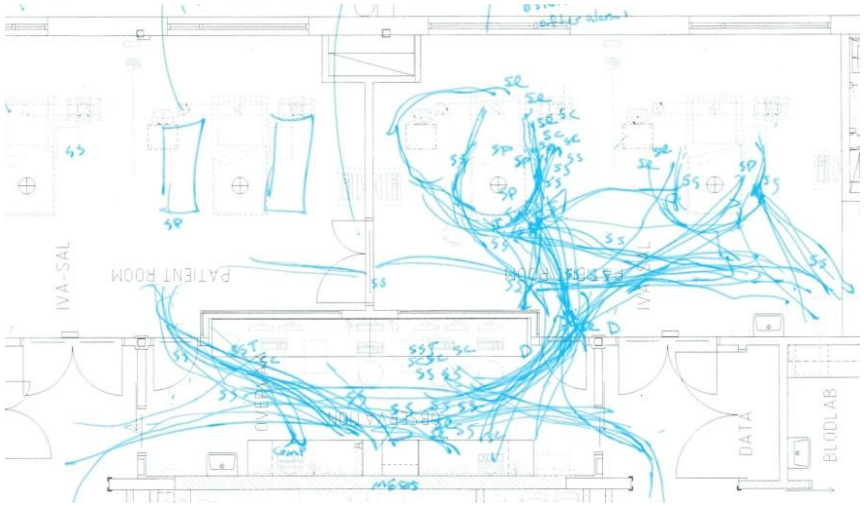
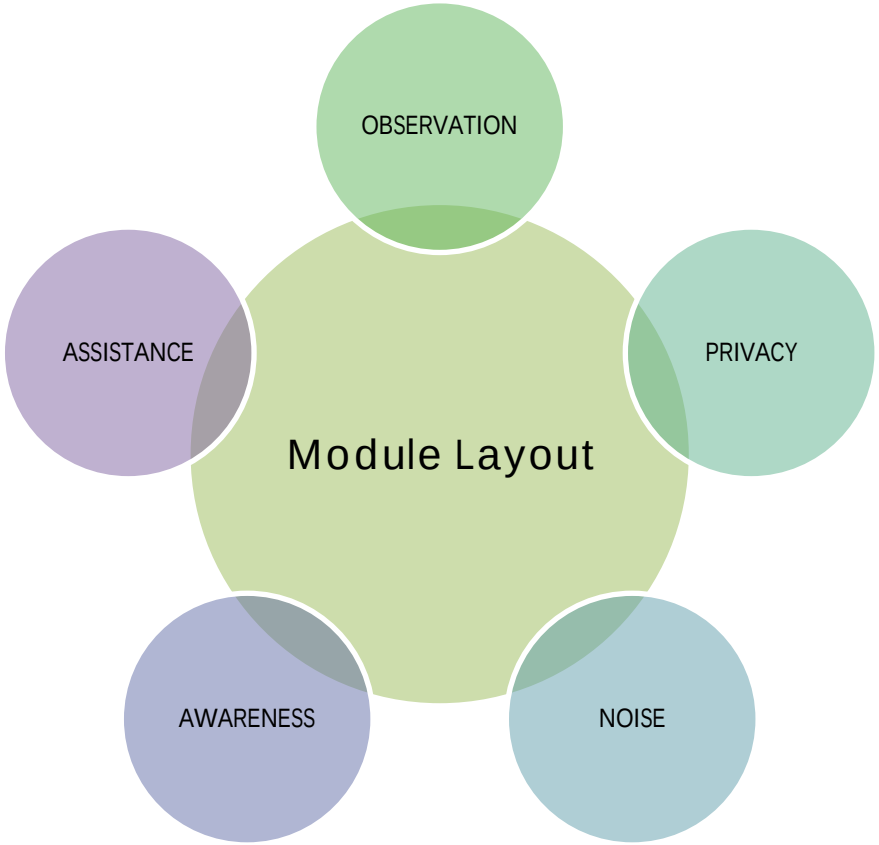


Figure 57 - Kungälv ICU Module - Primary flows are around the patient and in between the patient room and the observation/charting station, secondary flows are between patients of the same room and between patient rooms.



The design of the module connections determines how the space will be utilized. A thoughtful and purposeful balance must be obtained between several interdependent factors:

Figure 58 - Interdependent Factors of the Module Layout



- Which areas should not allow any noise to pass, and which should do so?
- In which areas is privacy desired? Does the level of privacy change in different situations?
- How can staff gain an awareness of their context, where their colleagues are, and what is happening around the unit?
- How can staff have effective observation of their patients?
- How can quick assistance be available to staff in a patient room?

The interplay between these factors often involves a series of doors and windows in key places, designing the appropriate degree of transparency into each condition. Even just with windows as a starting point, the type of connections and intents must be determined purposefully. Visual connections could be:

- Between patient rooms?
- Between a patient room and an observation/charting room?
- Between a patient room and the corridor?
- Between a patient room and outdoor space?

Ideally, a design will allow the environment to change quickly to support different care needs and activities. For example, at NÄL IVA there are blinds in the windows of the patient room and of the charting/monitoring room. The blinds can be adjusted as needed, even left half-up to allow some light and view to pass on an upper level, but to prevent most visibility. However, blinds may be left in the same position for a long time, out of convenience or neglect, and the appropriate levels of awareness, assistance, observation, and privacy may not be achieved. Another example of adaptability is the ICU at University Medical Center at Utrecht

where the glass between the patient room and the corridor can be transformed from clear to translucent.

All ICUs in this study featured a high level of visibility from the documentation room to the patient room, and from one patient room to another. However, the utilisation of the documentation room varied, as staff usually preferred to be in the patient room. In most units, there was a low level of visibility from the module to the corridor. At NÄL ICU with 2-3 staff per module, this low visibility may have contributed to staff members feeling alone, not aware of their colleagues, and having challenges in getting assistance. At Kungälv ICU and Mölndal ICU with 4-6 staff members working together in a module, these concerns were much less significant. (see

Figure 59)

In attempts to achieve these interdependent factors in single-bed rooms, patient room module designs feature varying levels of transparency. At NÄL ICU, high visibility within the patient room module creates an effective workflow, but low visibility to the corridor creates staff feelings of isolation. At NKS ICU (being built in Stockholm), the design of low to medium visibility within the module requires more staff, and may create feelings of staff isolation. At Utrecht ICU, high levels of visibility (glass walls to the corridor) allow the number of staff to be reduced and may allow staff to be well aware of their surrounding environment. Further, at Utrecht ICU patient room modules are grouped across the corridor to create facilitate a team workflow with the reduced staffing. Out of these three examples, patient privacy from the corridor may be best at NÄL ICU, where there is low visibility.

Figure 59 - Questionnaire results: visibility, collaboration, and privacy

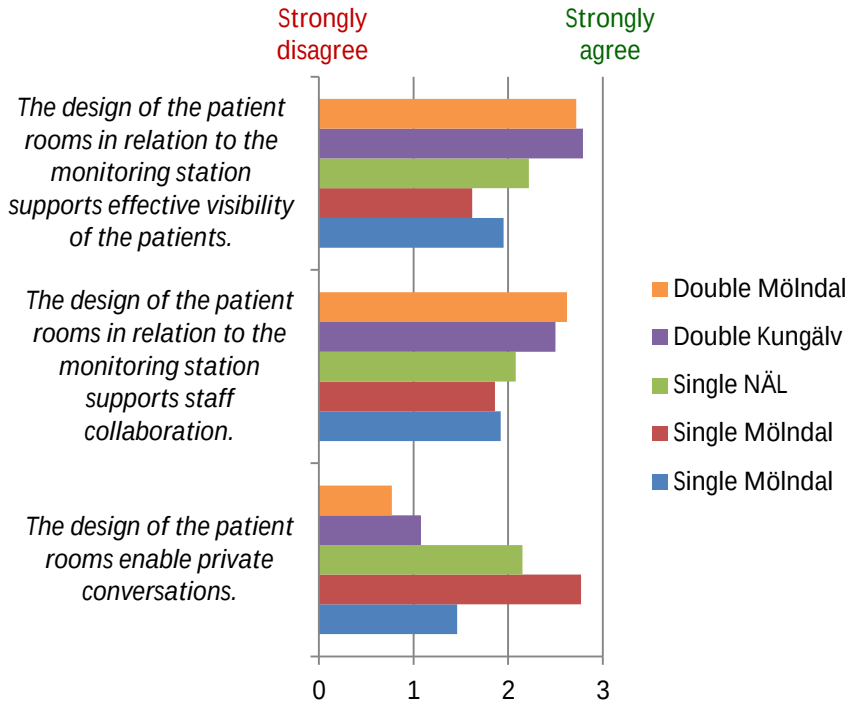
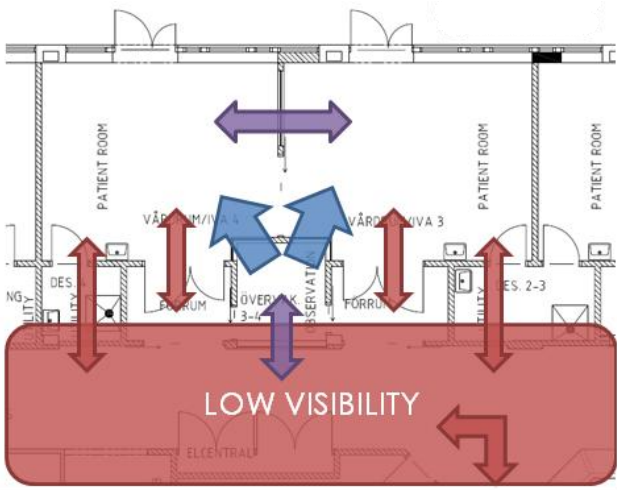
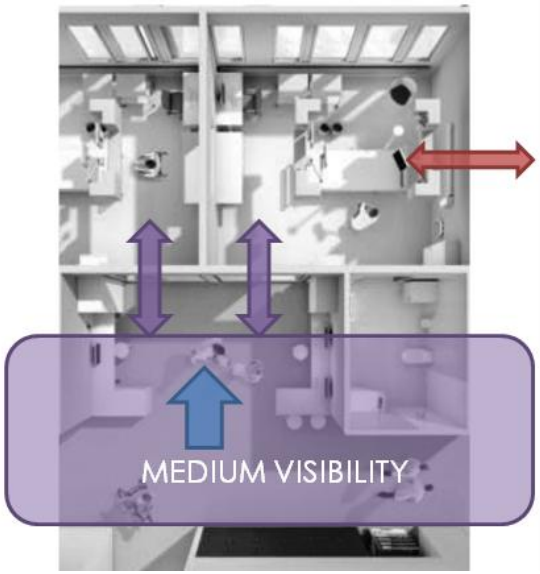


Figure 60 - Comparison of the transparency of three patient room modules. Transparency is measured based upon the presence of windows and doors.



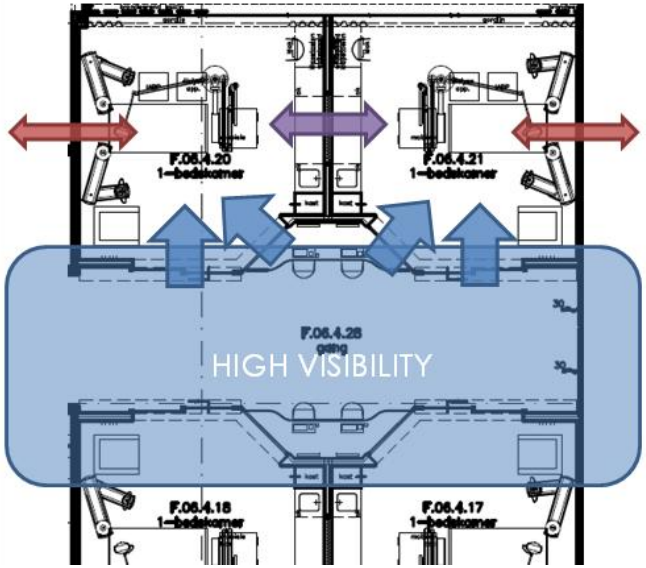
NÄL ICU - 2 staff per 2 patients
Low visibility: module to the corridor
High visibility: between patient rooms
High visibility: documentation rm. to patient rm.

Diagram by the author,
plan underlay by White arkitekter Göteborg



NKS ICU – 2-3 staff per 2 patients
Medium visibility: module to corridor
Low visibility: between patient rooms
Medium visibility: documentation area to patient room

Diagram by the author,
plan underlay by White arkitekter Stockholm



Utrecht ICU – 2-3 staff per 4 patients
High visibility: module to corridor
Medium visibility: between patient rooms
High visibility: documentation area to patient room

Diagram by the author,
plan underlay by Valtos Architects Rotterdam

As a result of analyzing and comparing the transparency and visibility of patient room modules, there are many examples of design questions that can be asked.

- Should an observation/charting station be an enclosed room, or be open to the corridor?
- If a single-patient room increases family involvement, and increases staff loneliness, can staff-family interaction be beneficial to staff well-being?
- Can technology be used to affect desired outcomes in non-traditional ways?
- What is the relationship between patient acuity-level, culture of care, module layout, and staffing ratios? If at NKS ICU the module utilises twice as many staff as at the Utrecht ICU module – does double staffing result in care that is twice as effective, twice as personal, and twice as expensive?

Several further design reflections and ideas arose during the course of the study.

- Existing double-bed units could have a partial wall built between beds. Most existing double-bed units feature mobile screens, which are nearly always present between patients. By using a more permanent wall (even if not fully enclosed rooms) a greater sense of privacy and family involvement may be encouraged.
- When a module has a sliding door between patient rooms, the door could be set to close automatically. This would still allow staff to pass between rooms, but by keeping the door closed most of the time, noise would be reduced and hand hygiene may be encouraged. Nurse visibility/access to both rooms at once would also be reduced.
- The "hybrid" patient room module with a sliding door could have the door permanently closed and locked, and the rooms would be able to function as true single-bed patient rooms.
- A camera could be placed in the patient room, to allow staff to monitor the patient from a separate location. This allows more patients to be observed at once, and increases privacy of the patient from corridor views. However, staff response time could be hindered, information miscommunication could occur, and care could be considered impersonal.
- Opportunity for staff activities such as monitoring, observation, and charting activities should be provided both in the patient room and outside the patient room, to give flexibility.

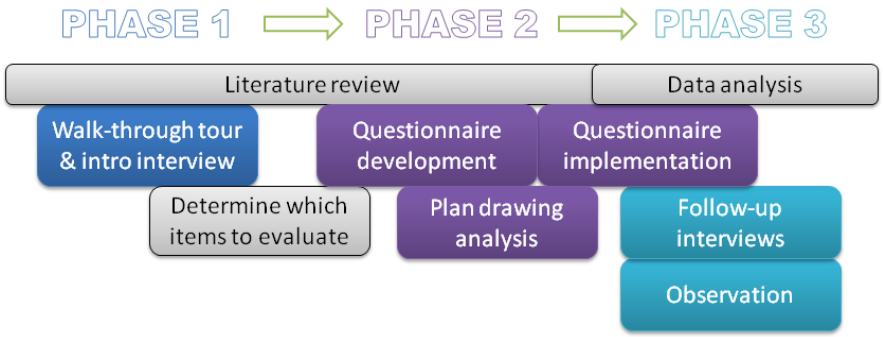
Reviewing study hypotheses

In section 8, *Study Methodology,* several hypotheses were identified in order to clarify the study purposes and in an aim to provide useful results. These hypotheses are reviewed here to see if the initial ideas were supported by the findings of the study.

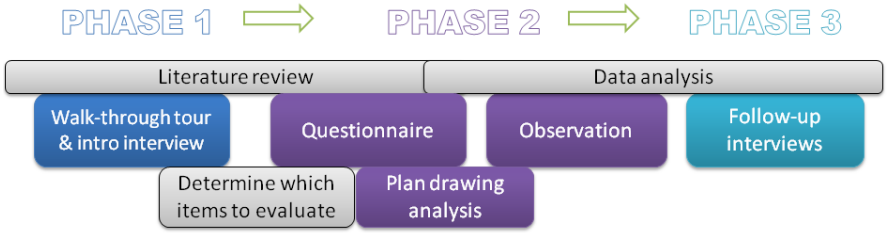
1. Sliding doors connecting patient rooms provides a useful method for varying between single bed rooms and double bed rooms.
    a. *A connecting sliding door appears beneficial to staffing and observation potential.*
    b. *Other outcomes (e.g. noise and infection) may or may not be positive and should be evaluated further.*
2. Compared to single-bed rooms, double bed rooms have reduced privacy and confidentiality.
    a. *Double-bed rooms were noted for concerns about lack of privacy, and observations revealed that conversations could be heard in adjacent rooms. Feelings of privacy vary by person.*
3. Compared to single-bed rooms, double bed rooms have more effective and efficient patient observation.
    a. *Double-bed rooms and single-bed room observation effectiveness is dependent on the module layout.*
    b. *Double-bed rooms may be more efficient by allowing one staff to observe two patients, yet a sliding connecting door may yield similar staffing results.*
4. Compared to single-bed rooms, double rooms provide more opportunities for staff interaction (e.g. sharing information, peer back-up).
    a. *Staff noted more feelings of isolation and difficulty in getting assistance in single-bed rooms.*
5. The rooms are supportive of allowing capable patients to look through exterior windows.
    a. *The ability for patients to have quality outdoor views is dependent on size, location, and height of a window.*
    b. *Factors such blinds and the content of the outdoor environment strongly affect the potential for a view and the quality of a view.*
6. Staff find the interior design of the new rooms to be pleasant and attractive.
    a. *In questionnaires, staff responses on average agreed with the statement that the rooms are pleasant and attractive. However, at NÄL ICU staff responses were more mixed.*

13. Reflections on study methodology

The study plan and process of this evaluation project was as follows:



However, reflecting on the process, the collection of data, and the analysis of results, the process could be improved by separating the phases more strictly, so that the results of one phase could more optimally inform the next phase. This is especially true in reflecting on the follow-up interviews at Kungälv ICU, which could have benefited from information learned from the questionnaires and observation. At NÄL ICU, the process was more successfully based upon one method informing the next, and as a result the follow-up interviews were more focused and produced more useful results. The follow-up interviews could be most useful in their ability to go more in-depth regarding information learned in the questionnaires and observations. A modified and improved process could be as follows:



In a more detailed sense, the study could improve the additional following items:

- Measure noise in the patient rooms in a quantitative way
- Get input from patient family members, via questionnaire or interview, regarding experiences and ideas of family involvement
- Perform small revisions to improve the questionnaire:
    - The open-input poster and the questionnaires could have been pilot-tested by more people to ensure the appropriateness of question wording.
    - The background demographics section of the questionnaire would be modified, since one participant of a very unique age and gender noted that he/she probably could be identified in the "anonymous" questionnaire.
    - The questionnaire could have been advocated more within the unit, and reminder notices given, to increase response rates.
    - Potentially, the questionnaire could be done online in every unit (rather than on paper), as the online version appears to have yielded more open-end responses.

14. Final words

This evaluative study of intensive care units has provided valuable information about how the spaces are used in real-life and how their functional performance is rated by their users. Intensive care units are complex and dynamic environments, with a multitude of interdependent factors in which design strategies can play a key role in reaching care and organizational outcomes.

At NÄL ICU, a result of the new "hybrid" single-bed room design is feelings of staff isolation and challenges in getting assistance from other staff. This is not a unique occurrence, but a common challenge in other facilities and organizations implementing a new model of care. (Friesen, Trojan, and Suter 2008) Further, achieving preferred levels of observation are difficult without increasing staffing ratios. On the other hand, patient privacy and family involvement are enhanced compared to multi-bed patient rooms.

At Kungälv ICU and Mölndal ICU, positive outcomes include excellent access to staff assistance and interaction, as well as and patient observation. However, challenges include low levels of patient and family privacy, and potentially higher levels of spread infection.

In this pivotal time in which Swedish intensive care shifts toward a model of single-bed rooms, this study provides information on the strengths and weaknesses of recent precedent projects and on the design strategies they incorporated.

Figure 61 – Charting/observation station between single-bed patient rooms (University Medical Centre Utrecht 2011)

List of Figures

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Note: images and diagrams were created by the author unless noted otherwise.

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PART 0

Background to the Thesis & Educational Reflections

Development of the Thesis Idea

The idea for my thesis topic began to crystallize during summer 2012 in a conversation with Stefan Lundin. Being healthcare architects, we discussed how it would be interesting to compare and learn from recent hospital projects around Scandinavia. There are constantly new ideas in the healthcare design industry. These ideas may take a long time to spread so that we can learn from each other. Even more importantly, the results of the ideas and strategies implemented in a project are often not evaluated or confirmed.

In my own experience working in architecture in the United States and in Sweden, we often finish a project and then move on to the next project with little reflection on the results of our design. Sometimes we do hear some results of our project through a brief communication with the client, in the news, or by going to tour a finished building. In the U.S., it is quite common to tour a finished project just as the construction is being completed. At such a stage we can assess the feel of the space and the quality of the construction, but there is no opportunity to learn how the building functions and how people respond to it.

Many types of industries and organisations around the world place a priority on reviewing and learning from previous work in order to improve future work. I believe that there is significant potential also for us as architects to learn about and improve upon our work. I have talked with many people about this topic, and read many articles, and there is significant agreement that following-up projects is important but rarely implemented. I hope that this thesis work can serve as a resource to encourage and enable other architects and planners to continually learn from and improve upon their designs.

Photograph after a building walk-through and "punch-list" evaluation to determine faulty or missing work.

Selecting an Area of Focus

In my own work, I enjoy design that is challenging, technical, and beneficial to people. As a result, I have primarily focused my academic and professional work on healthcare architecture. In developed, modern societies we have managed to control many forms of contagious diseases, and healthcare has shifted more towards preventative measures and to the management and study of non-preventable diseases. (Wermuth 2003) As such, in addition to the roles of medication and healthcare personnel, the role of the architecture in which healthcare is performed has come to play an increasing role. Around the world significant investments are being made in healthcare construction and in continued design research. From decades of research in environmental psychology, it is clear that the built environment has an effect on people's well-being. In all types of architecture, and especially in environments such as healthcare where people are in a vulnerable state, it is important that we as designers create places that people can enjoy and benefit from.

In order to maintain a thesis project scope that was manageable with the given time and resources it was appropriate to narrow the project focus. This allowed for a sufficient depth of investigation, a greater specificity and usefulness of results, and a level of exploratory academic learning.

I have chosen to focus on the intensive care unit, also known as the critical care unit, or in Swedish "intensivvårdsavdelning". Personally I have more experience working in other areas of healthcare design such as outpatient clinics and general medical-surgical wards, so the selection of intensive care allows me to expand my understanding of another area. This topic also allows me to collaborate (to a small degree) with an ongoing research project at the Chalmers Centre for Healthcare Architecture. The very existence of this research project is one of many signifying factors expressing that the design of intensive care units is an important and pressing topic today. Due to advances in medical technology, many patients who would have died several decades ago are now the type of patients found in the intensive care units of today – patients are sicker than before. Further, populations in industrialised countries are ageing at a rapid rate, creating increased needs for healthcare. Most intensive care patients are elderly. Most patients in intensive care units are in a critical life or death situation and require medically and technologically advanced care to survive. The environment must be designed accordingly to support the critical healthcare being performed, and it is imperative that designers understand the influence the built environment has on healthcare outcomes in order to make appropriate decisions during design. (Hamilton and Shepley 2010) Varying design strategies can have a different affect on certain outcomes, such as the design of single-bed patient rooms resulting in greater family involvement, or the design of double-bed patient rooms to reduce staffing costs. The outcomes can be as significant as the death of a patient or the financial downfall of a department. In many cases there is a lack of information to help in making these important design decisions. I hope that this report willserve as a resource to enable and encourage people to make informed design decisions.

During the last few years there have been several new intensive care units completed in Sweden. The majority of these are located in Västra Götaland – one each in Kungälv, Mölndal, and Trollhättan (NÄL). This gives a unique opportunity to collaborate with each of these hospitals and learn from the results of their projects.

Objectives of the Project

From a personal perspective I view the thesis as a special and unique opportunity in two ways: first, an opportunity to explore, research, and be creative in a way that probably will not be possible when I begin working again in a design office; and secondly, an opportunity to learn the specifically Swedish perspectives on healthcare, design, and evaluation. Throughout the work of the thesis I believe I been able to accomplish both of these goals. A key factor has been the opportunity to have relationships with the staff at the local intensive care units and to be somewhat immersed in that setting.

The academic and professional objectives of my thesis work are as follows.

The first objective of the thesis is to make the topic of "building evaluation" understandable and implementable for regular architects. The literature I have read is mostly academic in nature, and the non-academic practitioners I have talked to often do not have a clear understanding of what evaluation is or that it is possible for them to actually do it. The following examples are two of many to illustrate this:

In surveying and conversing with many architects, a common response is that evaluation is a nice idea but not practical in terms of cost or time. As a result of this predominant attitude, the practice of evaluation is not pursued in most situations, even a quick low-level type of evaluation that may actually be feasible for them. This thesis will give an architect a practical way to determine if/which manners of evaluation may be possible for their situation and some basic guidelines for how to go about the process.

Another example is of a recent conversation with a hospital client. In the planning of a new facility with goals of being a 'health promoting environment', she asks, "How can we know if we achieved our goals, if this really is a health promoting environment?" The thesis gives tangible tools and resources for answering such a question.

The second objective of the thesis is to generate new information about intensive care unit (ICU) design. This information can be used in several ways: locally and quickly, to make adjustments to how the unit operates; in the near future, to inform subsequent ICU designs; and also to inform future design guidelines. ICU design in Sweden is at a critical threshold of transitioning from designs with mostly two or more patients per room, to designs with only one patient per room. The effects of this shift in design strategy are significant in terms of staffing costs and healthcare outcomes, and the information resulting from this thesis is timely and important.

A third objective is to test and explore methods of building evaluation and report on the experience of implementing them. The methods and process of performing the ICU evaluation (objective number two) are incorporated into a "Handbook" that is relevant and accessible to design practitioners (objective number one).

The thesis report is divided into two main parts, each of which is designed to be able to use independently or together:

1. A Handbook on Facility Evaluation
    a. Audience: all types of architects, planners, and building managers
2. A Comparative Study of Intensive Care Patient Rooms
    a. Audience: architects, planners, and building managers; especially those working in healthcare

Project Process, Experiences, and Reflections

In the beginning of the thesis project I focused on literature review to learn about my two topics: building evaluation and intensive care design. I have never performed this type of building evaluation before so there was much to learn about how and why to do it. Learning more in depth about intensive care unit design was important to be able to optimally determine which aspects of the building are most appropriate to evaluate.

The next stages involved beginning to make contact with local intensive care units and simultaneously, to determine my project plan. During this time I also communicated with several other parties such as healthcare architects, nursing researchers, and a healthcare planner, in order to refine and focus my project scope in an optimum way.

The process of determining project goals and criteria to evaluate was quite extensive and challenging. For a long time it was not clear to me whether I should do a general and broad evaluation, or to do a more focused research-like evaluation. The conclusion was to place the project somewhere in between. In some projects a person may explore and make decisions along the way, but in this case it has been important to have a clear focus before implementing any actual evaluation work. One reason for this is so that the ICU managers were clearly aware of what my project involved before I began working in their unit. A second reason is that the focus and plan needed to be refined and tested prior to implementation, in order to ensure a quality outcome resulting in truly useful information. As a result of this refining process, I learned about the intricacies and trends in intensive care, which enabled me to communicate effectively with the nurses.

One factor that has affected the project to some degree is language. My limited proficiency in Swedish resulted in a greater use of English-language literature. Language was sometimes a small hindrance in being able to contact or communicate with nursing staff, but overall it has not been a major issue. On the other hand, limited proficiency in Swedish has potentially been a smallbenefit during my times in the ICU, since nursing staff may be less worried that I overhear a private conversation.

As a final reflection, I have enjoyed the opportunity to investigate a topic of interest and in depth. When I have been working in an architecture office before this type of work is rarely possible. The opportunities for me to tour, interview, and especially observe the ICUs were extremely valuable. From my own experience, it is rare that a designer has an intimate understanding of how people use the environment he or she designs, or that the designer has empathy with the users. Through the interactions I have been able to have, and the lengthy observations I have made in the units, my level of understanding has greatly increased. In the future, I will look for more opportunities to immerse in and deeply learn about the people and environments for which I design

Definitions / Glossary

Some healthcare-related definitions are presented here for the benefit of those persons less familiar with the subject. Other terms which are more contextually specific will be presented in Part 2 of this report.

Ante room – A "pre" room which a person enters before entering the actual work room (e.g. patient room). Ante rooms are often used to minimize the spread of infection. (Swedish "sluss")

Disinfection room – A room used for cleaning of dirty instruments before they are taken to a sterilization department, or for reuse for non-sterile purposes. Most ICU patients cannot use the toilet, but rather a pan in the bed, and this pan can be emptied in the disinfection room. Other used supplies can be stored here until ready to be taken from the department. Also known as a dirty utility room or a patient toilet, depending on the specific functions included.

A disinfection room

Intensive Care Patient – A person in a poor state of health who stays in the ICU. Some patients are completely sedated (asleep), and some patients are alert enough to speak or to sit in a chair. Many patients are attached to a mechanical ventilator to help with breathing. All patients will have technological monitoring equipment continually checking their status.

Intensive Care Unit – A department in the hospital where the sickest patients are treated. A significant number of staff, specialized equipment, and monitoring systems help to keep a patient's condition stable until they can recover and move to a less acute department. Patients may stay here for as little as a day or as long as many months. This department is also known as ICU, CCU, Critical Care Unit, and in Swedish, "intensivvård" eller IVA.

Intermediate Care Unit – A department in the hospital where an ICU patient may be transferred after they begin recovering from the ICU, but they are not yet well enough to be in a regular hospital ward. Also known as a Step-Down Unit or High Dependency Unit (HDU), and Swedish "IMA".

Isolation patient room – a specialized room for patients who have a contagious disease (or more rarely for patients whose immune systems are weak). In the former case, the room will have negative pressure ventilation so air cannot leave the room. An ante room (vestibule) is commonly used as a place to change clothes, prepare supplies, and control ventilation.

Observation/Monitoring Room – This room is often attached to the patient room(s), and is a place where staff can work while also keeping track of patients, via computer monitors and often also by looking directly through a window to see the patient.

Patient rehabilitation/mobilization – In the context of the ICU, rehabilitation can mean simple tasks such as having a patient sit up in bed, stand next to the bed, sit in a chair next to the bed, or walk. The task depends on the patient's ability. Specialized staff and equipment often assist with these tasks.

Patient Room – This is the room where the patient stays most of the time. The room is usually quite large to allow for many staff and equipment. In some patient rooms, especially in older units, there are several patients in one room (e.g. "double bed room"). In some units, especially newer units, each patient has his or her own room (ie. "single-bed room" or "single room").

Pendant System – A piece of equipment mounted to the ceiling, with moveable "arms" extending down and providing access to equipment such as electrical outlets, gases, monitors, etc. Pendant systems are commonly found in operating rooms and in some new ICU patient rooms.

A pendant system with "arms" to locate equipment on either side of the bed.

Post-Op Unit – A department in the hospital where patients go after they have a surgical operation performed. When a patient wakes up, he or she may go home the same day or be transferred to a regular ward. If the patient condition is not stable then he or she may go to the ICU. In Sweden, "Post-Op" is the area for patients who will stay in the hospital for recovery, and UVA or DUVA is the area for "day surgery" patients going home the same day.

Support space – An area or group of rooms intended to support the main care activities in the unit. Support spaces can include medication rooms, conference rooms, utility rooms, supply rooms, etc.

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Appendices

1. Additional specific evaluation results not included in the report
2. Overview of research project (explanatory document given to inform unit managers)
3. Questionnaire – example in English
4. Questionnaire results – NÄL ICU (Swedish)
5. Questionnaire results – Kungälv ICU (Swedish)
6. Questionnaire results – Mölndal ICU (Swedish)
7. Follow-up interview questions – NÄL ICU
8. Follow-up interview questions – Kungälv ICU
9. Open-input poster example

Appendix 1

Appendix 1 – Additional Specific Evaluation Results

The following items described below were learned during the evaluation process, but their content was not included in the main report due to differing levels of detail and/or focus.

NÄL ICU

Other comments regarding staff assistance spoke of a difficulty in reaching alarm buttons, especially in intense situations such as when a patient is trying to remove a ventilator tube. The unit has been experimenting with different pendant configurations to make the alarms more reachable.

Some patient room modules near the central nurse station have large sliding doors along the corridor wall. Two nurses asked about the doors were not aware of the doors' purpose, and said they were never used. Later a third-party person suggested the doors may be used at night to reduce light and noise entering the patient room.

At the main entry door from the public corridor, the sliding door has a horizontal fritted frosted glass pattern that increases privacy but prevents staff from being able to identify a visitor (in an attempt to get closer to see, the door opens automatically due to the automatic sensor). In some cases people have visited the unit with malicious intentions and a staff member stated that it feels safer to be able to clearly identify a visitor.

The floor color in some areas causes difficulty in seeing dropped needles or spilled liquids.

Some walls use water-based paint, which has started to come off already due to normal cleaning.

In the patient rooms, the exterior wall can be a noticeably cold temperature. One person commented that patient room temperatures are controlled centrally and it can take up to a day to change temperature.

A potential negative aspect of opening the patient room doors to the outside is the affect it may have on room air ventilation. One comment also had concerns about the doors being open too long and causing the room to become overly cold: "We cannot have 15 degrees inside an ICU room…"

The doors to the patient room close too fast and can make contact with a person entering/exiting

Kungälv ICU

There is a phone on the wall in the corridor across from the single-bed rooms. It is very loud when it rings. The ring tone is not like a traditional phone ring tone, slightly more like an alarm.

One nurse told a story about how a few times there were flies in the surgery department. They didn't know the exact cause/source but they took precautions in the nearby fikarum such as put a

screen over the balcony door, they no longer use the sliding door to the corridor, and also they are not allowed to have fruit sit out anymore.

It is important to have the bell on the door to enter the unit to have more control of visitors entering, for example if an upset family member is visiting and could be dangerous.

One staff member expressed strong displeasure about having to take bags of waste on a cart a long distance to the edge of the unit (about 50 meters).

One staff member stated a like of the yellow floor color, but that he/she did not feel it was working optimally. (Älskar den gula färgen på mattan (trots att den inte fungerar optimalt)

One staff member expressed displeasure that the documentation workroom is also sometimes used as a pass-thru corridor.

At the glass box with glass doors, people were sometimes trying to enter the room when the door was closed. As a temporary solution they have put up stickers on the glass to increase visibility of the door, and soon they hope to put a frosted coating on the bottom third of the door. The glass box is elevated by one step (two risers) to give increased capacity of observation. However, the step color is the same as the color of the raised floor and of the lower floor, making the height difference difficult to discern. There are no plans yet to address this issue. Lastly, in the raised observation rooms sometimes a person sitting in a chair with wheels would roll near the edge of the platform or down the step. They have not put a raised surface on the perimeter of the platform edge to deter chairs going over the edge.

Mölndal ICU

An example of a change to the environment after project completion is the removal of a mirror over the hand-washing sink in the patient room. The causal story is when a patient began to recover and could finally sit up, the first thing she saw was an old weary lady in the mirror (i.e. herself). This experience was very discouraging and may have affected her recovery rate.

2012-11-07
Mike Apple

CHALMERS

Overview of the IVA Environment Student Research Project

Thank you for your interest in collaborating with this student project! This study is a master's thesis project in the department of Architecture at Chalmers tekniska högskola. Since the care performed in intensive care units is of great importance, this study aims to support the design of improved critical care environments, focusing on the patient room pod. This project has two parts:

1. To explore methods of learning from completed buildings
2. To perform evaluations learning from recently completed IVA projects

This document concerns part two of the project.

Purpose: To learn the strengths and weaknesses of recently built intensive care units, and to discover the affect of the built environment on staff, families, and patients. Information learned will benefit future IVA designs in Sweden.

Setting: Double-bed and single-bed intensive care patient rooms at local intensivvårdavdelnignar

Research questions:

- Are the patient room environments supportive of nursing care, family involvement, and patient recovery?
- How do double-bed rooms compare to single-bed rooms in affecting these goals?

Data Collection: all data will be gathered anonymously (without personally identifying information). The focus of all data collection is to learn about the use of the care environment.

- *Questionnaire* – a two page questionnaire (in Swedish) will be given to staff
- *Interviews* – 3 staff will be interviewed (in English) for 20-30 minutes each
- *Observations* – the student will stand in the övervakningsrum (or corridor) for several hours to observe how the patient room is used and what types of interaction occur
- *Graffiti wall* – a large blank paper will be placed in the fikarum for one week for staff to provide spontaneous comments about the patient room environment

Schedule: The preparation for this study has been performed in September and October 2012. The data collection phase is November. The analysis and write-up will be performed in December.

Contact: All persons are welcome to ask questions or make comments regarding the study. Each participant is also welcome to request to read the draft report before it is published.
Please contact Mike Apple at 0704 186 265 or applem@student.chalmers.se

IVA MILJÖENKÄT

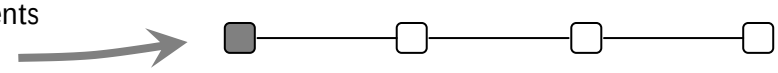
CHALMERS
Student Research Project

Thanks for taking time to fill in this anonymous questionnaire about the design of the physical environment of the intensive care unit. The goal of this project is to understand how the patient room environment can be more supportive for patients, families, and staff.
If you have any questions, please contact Mike Apple at email address: applem@student.chalmers.se

ENGLISH QUESTIONNAIRE NOT DISTRIBUTED, SHOWN AS EXAMPLE ONLY

Del 1 : Background questions

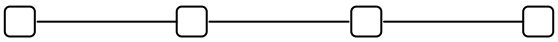
1. Your training: _____
2. Year employed since (circle one): mindre än 1 år 1-3 år 4-10 år 11+ år
3. Your age (circle one): under 30 30-39 40-49 50-59 60+
4. Your gender (circle one): man kvinna

Please rate the following statements by marking in this way: 

Del 2 : The design of the patient room: Single-room

	Strongly agree	*Agree*	*Disagree*	*Strongly disagree*
5. The design of the single room gives opportunities for patients to have a view of the outdoor environment.	☐	☐	☐	☐
6. The design of the single room supports patient mobilization / rehabilitation.	☐	☐	☐	☐
7. The design of the single room supports patient orientation of time, place, and person.	☐	☐	☐	☐
8. The design of the single room gives adequate daylight.	☐	☐	☐	☐
9. The design of the single room gives adequate opportunities to control the environment (t.ex. light, temperature, equipment)	☐	☐	☐	☐
10. The design of the single room is inviting for relatives and gives place to be involved.	☐	☐	☐	☐
11. The design of the single room makes possible private conversations.	☐	☐	☐	☐
12. The design of the single room (feel, appearance, atmosphere) is attractive.	☐	☐	☐	☐
13. The design of the single room in relation to the monitoring room supports staff collaboration.	☐	☐	☐	☐

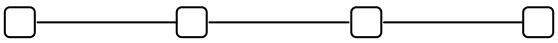
14. The design of the single room in relation to the monitoring room supports effective patient observation.



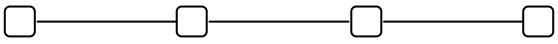
Instämmer helt *Instämmer delvis* *Tar delvis avstånd* *Tar helt avstånd*

Del 3 : The design of the patient room: double room

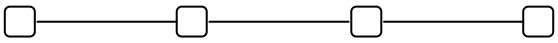
15. The design of the double room ger möjligheter för patienterna att ha utsikt över utomhusmiljön.



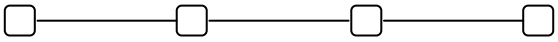
16. The design of the double room stödjer mobilisering/rehabilitering av patienter.



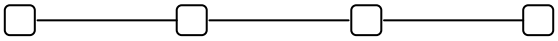
17. The design of the double room stödjer patientens orientering av tid, plats, och person.



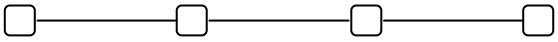
18. The design of the double room ger adekvat dagsljus.



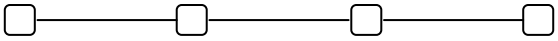
19. The design ofdubberummen ger adekvat möjlighet till kontrol över miljön (t.ex. ljus, temperatur, utrustning)



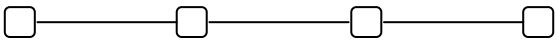
20. The design of the double room är inbjudande för närstående och ger plats att kunna vara delaktiga.



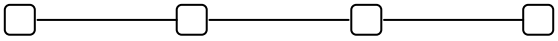
21. The design of the double room möjliggör privata samtal.



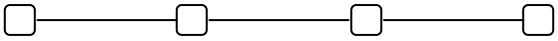
22. The design of the double room (stämning, känsla, utseende) är tilltalande.



23. The design of the double room i förhållande till övervakningsplatsen möjliggör samarbete för personalen.



24. The design of the double room i förhållande till övervakningsplatsen möjliggör effektiv tillsyn av patienten.



Del 4 : Öppnat svar

25. Hur skulle patientrummen kunna vara mer stödjande för närstående att vara med delaktiga?
ENGLISH How could the patient room be more supportive for relatives to be more involved?

26. Övriga kommentarer om patientrumsmiljön?

ENGLISH Other comments about the patient room environment?

Tack för din medverkan! När du fyllt i enkäten, vänligen ge den till enhetschefen senast den 30 november 2012.

Appendix 4

CHALMERS
KURSUTVÄRDERINGAR

Visa resultat

Här kan se resultatet från utvärderingen och exportera statistiken till ett annat program. Det går också att göra en enkel filtrering genom att klicka på svarsalternativen och kommentarerna eller en avancerad filtrering genom att använda knappen längst ned.

Utvärderingar

Aktuella utvärderingar
Till min startsida
Hjälpsida
Logga ut

Tillbaka till huvudsidan

Visa jämförelsestatistik

IVA MILJÖENKÄT - NÄL

Status: Avslutad
Öppen för svar: 2012-11-21 - 2012-11-30
Antal svar: 37
Procent av deltagarna som svarat: 14%
Kontaktperson: Mike Apple»

Del 1 : Bakgrundsfrågor

1. Din yrkesutbildning

37 svarande

Sjuksköterska»	17	45%
Undersköterska»	11	29%
Läkare»	9	24%
Sjukgymnast»	0	0%

Genomsnitt: 1.78

- *Specialistsjuksköterska inom intensivvård» (Sjuksköterska)*

2. Är anställd sedan

37 svarande

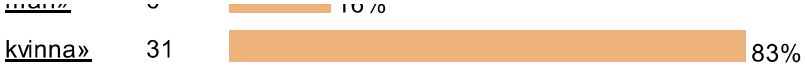
mindre än 1 år»	3	8%
1-3 år»	9	24%
4-10 år»	8	21%
11+ år»	17	45%

Genomsnitt: 3.05

3. Kön

37 svarande

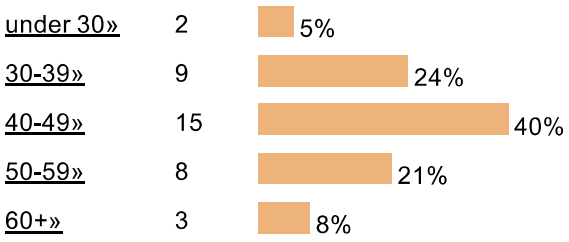
man»	6	16%



Genomsnitt: 1.83

4. Din ålder

37 svarande



Genomsnitt: 3.02

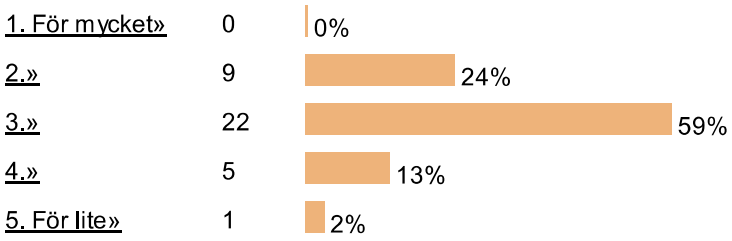
Del 2 : Vad tycker du om IVA patientrummen?

5. Storlek och ljud:

Matrisfråga

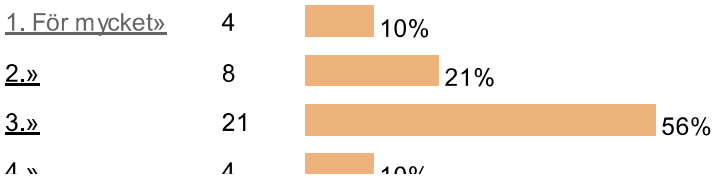
- *Vid vissa fall av mobilisering och behov av mycket apparaturer är det lite på gränsen till för trångt i fåtalet fall. Även då anhöriga kommer blir det lite mer ont om plats.»*
- *De känns ej för små utan helt optimala rum.»*
- *vad jag menar är att jag tycker storlek och ljud är väldigt bra»*
- *För höga ljud för larm. Larm går ofta ganska länge innan det kvitteras. Larmgränser borde anpassas mer individuellt till patient och situation utav ssk på salen.»*
- *Alla salar är inte samma. Vissa är mer svårarbetade och man måste veta hur pendlarna skall stå för att arbetet skall fungera.»*
- *Det går inte att få det tysst på rummen, även om inte personalen pratar. Teknisk apparat surrar, luftmadrassen i sängen brummar, larm från övervakning mm.»*
- *Rum nr 8 är minst och därför belägger vi denna plats sist. Trångt runt pat.sängen ffa. vid huvudändan. Måste flytta på ena pendeln för att komma in och ut ur rummet med sängen»*
- *fÖRSTÅR INTE RIKTIGT FORMULERINGEN PÅ FRÅGAN RUMMEN ÄR STORA OCH LJUDNIVÅN BRA»*
- *Ljudnivån är stundtals hög och det beror på sängarna som låter likt ett jetplan, man undrar ju vad det kommer sig. vidare för alla pumpar och apparater väsen , det borde gå att få apparater betydligt tystare. »*
- *Med 3 menar jag väldigt bra. Ljudnivån har blivit mindre då det är stängda rum,vilket är väldigt bra för patienten»*

Vad tycker du om patientrummets storlek?
37 svarande



Genomsnitt: 2.94

Vad tycker du om ljudnivån i patientrummen?
37 svarande



4.»	4	10%
5. För lite»	0	0%

Genomsnitt: 2.67

Del 3 : Design av patientrummen

6. Utformningen av IVA patientrummen:

Matrisfråga

- *Tolkar "utformning av patientrummen" så att det även avser nuvarande platsering av säng och pendlar som är avgörande för svar på 5:e frågan. Tolkar "övervakningsplats" som "buren" utanför 2 sammanhörande rum.»*
- *Kontrollen av ljus, temp, utrustning är främst tillgänglig för personalen. Pat kan ej personligen styra dessa funktioner.»*
- *Väldigt avskalade rum, inget för patienten att titta på, inte ens klockan är placerad så patient i säng kan se den. Finns plats för anhöriga men ingen "trevlig" miljö.»*
- *Det går inte att övervaka patienten säkert från övervakningsplatsen. Hade det funnats dörr direkt in från övervakningsrummet till patientrummet så hade möjligheten att använda det varit större. Man hade varit snabbare på rummet och man hade hört vad som sker på rummet. Förstora steg i skillnaden på ljusstyrkan. Finns inget "lagom" ljus för skötsel nattetid. Tempraturen på rummet tar 24 timmar att reglera. Bra med fönster på patientrummen men stora buskage utanför som förhindrar kontakt med omvärden för patienten.»*
- *En del frågor mycket svåra att besvara. Rummen bra ur isoleringssynpunkt men personalkrävande - går åt mer personal»*
- *Iva ligger i BV. Alla rum har fönster på ena väggen av rummet. Pga insyn måste vi täcka en del av fönstret med persienn el.plastfilm. 6 av rummen har dörr ut.Däremot kan vi ej köra ut sängen genom den. 2 av rummen är isoleringsrum och där kan vi via sluss köra ut en säng. i det fria.»*

Utformningen av patientrummen ger möjligheter för patienterna att ha utsikt över utomhusmiljön
37 svarande

Instämmer helt»	5	13%
Instämmer delvis»	22	59%
Tar delvis avstånd»	5	13%
Tar helt avstånd»	5	13%

Genomsnitt: 2.27

Utformningen av patientrummen stödjer mobilisering/rehabilitering av patienter.
37 svarande

Instämmer helt»	13	35%
Instämmer delvis»	18	48%
Tar delvis avstånd»	6	16%
Tar helt avstånd»	0	0%

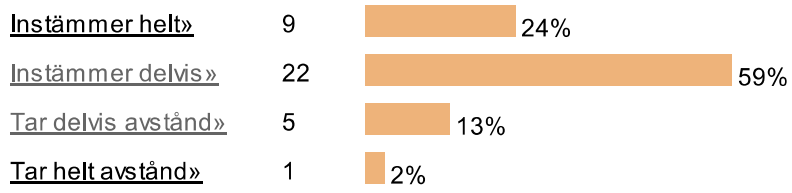
Genomsnitt: 1.81

Utformningen av patientrummen stödjer patientens orientering av tid, plats, och person.
37 svarande

Instämmer helt»	3	8%
Instämmer delvis»	19	51%
Tar delvis avstånd»	12	32%
Tar helt avstånd»	3	8%

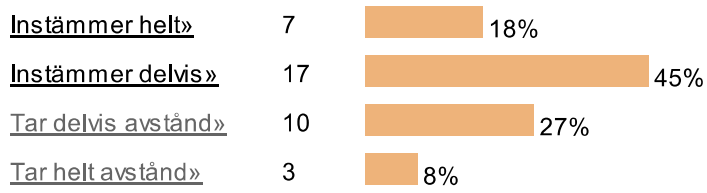
Genomsnitt: 2.4

Utformningen av patientrummen ger adekvat dagsljus.
37 svarande



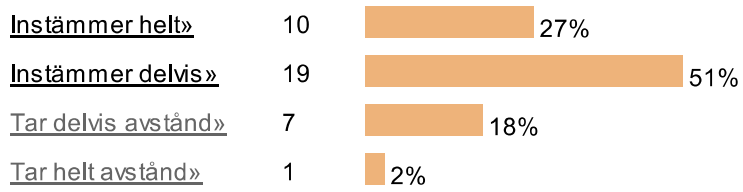
Genomsnitt: 1.94

Utformningen av patientrummen ger adekvat möjlighet till kontroll över miljön (t.ex. ljus, temperatur, utrustning).
37 svarande



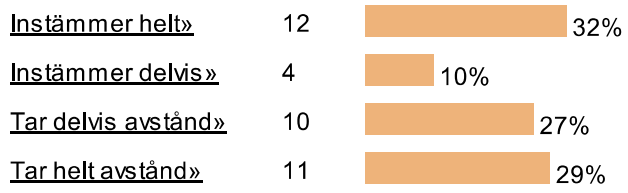
Genomsnitt: 2.24

Utformningen av patientrummen är inbjudande för närstående och ger plats att kunna vara delaktiga.
37 svarande



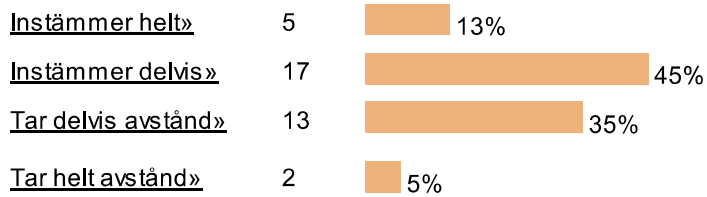
Genomsnitt: 1.97

Utformningen av patientrummen möjliggör privata samtal.
37 svarande



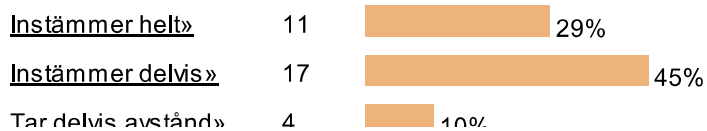
Genomsnitt: 2.54

Utformningen av patientrummen (stämning, känsla, utseende) är tilltalande.
37 svarande



Genomsnitt: 2.32

Utformningen av patientrummen i förhållande till övervakningsplatsen möjliggör samarbete för personalen.
37 svarande



Tar helt avstånd»	5	13%

Genomsnitt: 2.08

Utformningen av patientrummen i förhållande till övervakningsplatsen möjliggör effektiv tillsyn av patienten.
37 svarande

Instämmer helt»	14	37%
Instämmer delvis»	12	32%
Tar delvis avstånd»	6	16%
Tar helt avstånd»	5	13%

Genomsnitt: 2.05

7. Övriga aspekter med design av patientrummen:

Matrisfråga

- *Kontakt med annan person mest genom telefon»*
- *Att ha en dörr ut har inte spelat så stor roll för patienten, vi har ej gått ut med patient den vägen.Känns inte skyddat för patienten, bättre om det hade varit inhängnat så man slapp insyn.»*
- *Övervakningsrummet används inte för att övervaka pat. Vi ska vara inne hos pat jämnt.»*
- *Fråga 4: När jag som läkare är på rummet så finns ju alltid en ssk/usk antingen på salen bredvid eller oftast även på salen. Fråga 5: Vad menas med "patientinformation", menas det patientjournal på dator, på papper, eller övervakningen? Oavsett, så blir svaret både på rummet och på övervakningsrummet, det avser helt enkelt olika situationer, som dock både förekommer ofta. »*
- *Optimalt för mig är, att kunna få patientinfo. och samtidigt, det inte minst viktiga, att se hur patienten mår. Kunskap och kontinuitet viktig.»*
- *Dörr ut är väl en bra tanke men svår att utnyttja. Bara enstaka gånger har jag möjlighet att ta upp patienter så pass att jag kan sätta dem vid dörren för en nypa luft. Patientinformation är lättast att inhämta i övervakningsmodulen där du har en bättre arbetsstation samt blir mindre störd av övervakning etc.»*
- *Går ej att övervaka 2 patienter utan att ha dörren öppen mellan rummen.»*
- *Skjutdörren är öppen ca 1 m för att vi ska kunna ha tillsyn över båda patienterna.Dörren ut känns viktig för att den bundna patienen till sängen ska kunna känna in väder och vind. Däremot är du väldigt isolerad när du lämnas ensam som personal.Telefon eller nödknapp att ringa som är svår att nå beroende på var du befinner dig i förhållande till sängen. Vinst med att när du är inne hos patienten har tillgång till journal,ordinationer och osv.»*

Skjutdörren är en viktig del av rummets utformning.
36 svarande

Instämmer helt»	18	50%
Instämmer delvis»	15	41%
Tar delvis avstånd»	2	5%
Tar helt avstånd»	1	2%

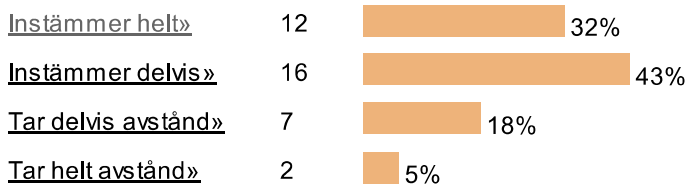
Genomsnitt: 1.61

Jag föredrar att lämna skjutdörren öppen för det mesta.
37 svarande

Instämmer helt»	11	29%
Instämmer delvis»	18	48%
Tar delvis avstånd»	7	18%
Tar helt avstånd»	1	2%

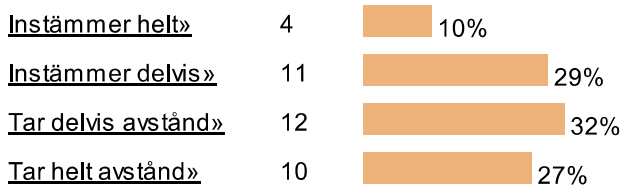
Genomsnitt: 1.94

Att patienterna har en dörr mot utsidan av byggnaden är en viktig del av rummets utformning.
37 svarande



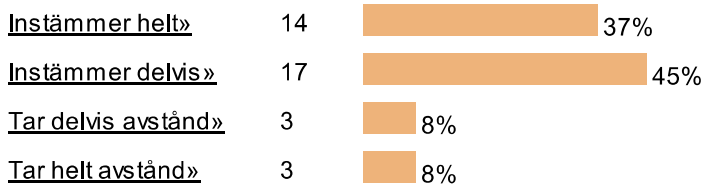
Genomsnitt: 1.97

När jag arbetar i patientrummet det är lätt att ta kontakt med en annan person för att få hjälp.
37 svarande



Genomsnitt: 2.75

Jag föredrar att titta på patientinformation i patientrummet i stället för i övervakningsrummet.
37 svarande



Genomsnitt: 1.86

Del 4 : Öppnat svar

8. På vilket sätt hindrar/stödjer utformningen av patientrummen personalens samverkan? (t.ex. assistans, socialisering, handledning)

- *Placeringen av vissa tillbehör på pendlarna i taket försvårar för vissa arbetsuppgifter, exempelvis placering av sugkatetrar och stickande avfalls-boxar.»*
- *Mer personalkrävande. »*
- *Om man är tillräckligt med personal dvs 3 personal på 2 rum, så fixar man och ordnar med patienterna, missar inget! Då behövs sällan hjälp utifrån korridoren. Dock kan det kännas instängt, och man "isolerar sig lite" Mycket spring ffa för sjuksköterskan, och då är det ännu mer värdefullt med att vara tre så att de andra två ur personalen ser till patienterna. »*
- *Vi är för isolerade från våra kollegor. T.ex. hör vi inte vad det pågår utanför vart rum.Vi kommunicerar via telefon med vara kollegor. »*
- *påverkar inte åt nåt håll. Det viktiga är att vi har plats.»*
- *Isolerad svårt att få kontakt om man behöver hjälp och larm klocka inte är lätt åtkommlig»*
- *Är isolerande/ men skapar lugn.... om det är kompetent personal som kan lunga annars har det motsatt effekt. Sett avarter.»*
- *Rummen förhindrar ögonkontakt. Man är "instängd" i rummen, dörrarna är stängda o man ser inte vad som händer utanför.Hör inte heller. Mycket isolerad.»*
- *Frågan är mycket relevant för andra yrkeskategorier dvs ssk/usk, tror nog att du får bra svar av dem. Som jag hörde så kan de känna sig ganska så isolerade från sina arbetskamrater, ibalnd nästan "instängd" på rummet.»*
- *Avskärmat, instängt. Klaustrofobiskt. Svårt att hjälpa till eller få hjälp. Krångligt att få assistans men det har mer med bemanningen att göra.»*
- *Pendlarna kan vara i vägen. Man måste aktiv tänka på att ha rent runt sängen från saker.»*
- *Går ej att se vem som finns i andra patientrum (förutom det i direkt anslutning till det egna rummet).»*
- *Avskilda patientrum med stängda dörrar hindrar effektivt allt det ovanstående!»*
- *Ser inget hinder. Fantasin det enda som sätter gränser.»*
- *MAn blir isolerad på rummet och har liten kontakt med personal i korridor. I sammarbetet på salen ges det större utrymme till delaktighet då man är lättillgänglig.»*
- *Pendlarna är både i vägen och ett hjälpmedel. Begränsar "svängrummet" i rummen. Annars är det god tilltagen golvyta. »*
- *Arbetet på sal blir avskilt från "korridoren" då dörrarna mot denna alltid är stängda. Detta gör bra arbetsro på salen men det är*

- Arbetet på sal blir avskilt från "korridoren" då dörrar ut mot denna alltid är stängda. Detta ger bra arbetsro på salen men det är mycket svårt att uppfatta läget på övriga avdelningen, vart det händer mycket osv. Men upplever det lätt att få hjälp när jag behöver och handledning på sal blir utmärkt då det blir en lugnare arbetsmiljö.»
- Kan bli stimmigt och störigt med mycket folk på salen. »
- Inget sammarbete mellan samma yrkeskategori på patientrummet eftersom 1 usk+1 ssk vårdar 2 patienter på salen. "Ingen" annan deltar i vården om man inte ber om hjälp.»
- Som läkare påverkas man lite, övrig personal är ofta lite isolerade till två-patient modulen och de som arbetar där»
- Den hindrar oss på många plan.Vi är isolerade inne på rummen.Vet ej vad som händerpå avd,vilka patienter som kommer,vilken övrig personal som jobbar.Kan ej bara öppna dörren ut ikorridoren och tro att jag kan få hjälp. Måste ringa och be om hjälp! Ronder görs i buren utanför rummen.Upplever att de är mer stressade nu när avd. är så stor (10-14platser) men ur hygiensynpunkt med nya multiresistenta bakterier är det en fördel att vårda såhär men mindre trivsamt för personalen. »
- MAN ÄR ENSAM MYCKET PÅ SALEN»
- Dessa funktioner bygger på att det är gott om personal. Det är svårt att få assistans eller hjälpa varandra när det är låg bemanning. Är man bemannade som det förordas på iva, dvs två personal på två patienter, är det svårt med assistans och handledning.»
- Det blir trångt då många apparater/maskiner är igång samtidigt.Pendlarna kan inte flyttas i den grad vi önskar.»
- Önskar att jag hade kunnat höra salen när jag sitter i buren!!!»
- Man är hänvisad till sin enhet det naturliga lärandet har försvårats pga få av samma yrkesgrupp som finns på varje enhet.»
- Eftersom rummen är utformade som de är så anser jag att det är svårt att få assistans, man är väldigt ensam p rummet ofta och alla är på sina rum, finns ingen ute i korridor. Det är instängt»
- Man kan känna sig utlämnad i krislägen, ex om pat vaknar och försöker extubera sig självoch du står så att du inte når någon ringklock, har hänt.»
- Hinder att det är stängda rum just vid kring de här bitarna»

9. Om du har arbetat på en annan IVA med dubbelrum, hur uppfattar du den här enheten med enkelrum i jämforelse med dem?

- Har endast arbetat på denna intensivvårdsavdelning. Vid kortare studiebesök på intensivvården i karlstad centralsjukhus ansåg jag våra lokaler som rymligare, fräschare, nyare och bättre.»
- Bättre integritet för patient och anhöriga. »
- Bättre för den enskilde patienten och dess anhöriga.Patienten störs sällan av "grannen"»
- Pat har mycket mer lugn och ro, blir inte så störda av andra pat. Men visst ljuser det in i det andra rummet, när vi jobbar på nattetid. Och om grannpat skriker så hörs det ändå i rummet brevid.»
- Detta är mkt bättre.»
- helt hopplöst om du har två oroliga patienter- som drar i slangar osv. jag kan bara vara där jag är inte på två ställen allts - söva ner en och ta en i taget.....Drar mer personal oaktat var ledingen tycker.»
- mycket lugnare, men det är även ett mycket mer isolerad arbetssätt, hjälper och utbilder "kostar" mer personal/Tid eller händer inte»
- Fördelar med enkelrum som här hos oss är fallet: hygien, petientintegritet, sekretess, miljö för patienter som inte störs lika mycket som på dubbelrum i fall att det ligger en "tung" patient på rummet bredvid (dvs nytillkommen pat, mycket medicinska eller omvårdnadsåtgärder, instabil patient med många larm m m). Nackdelar v g se fråga 8. Jag anser att skjutdörrar är mycket viktiga för att det då vid behov kan bli ett "dubbelrum" ändå. Enkelrum den fasta väggar istället av skjutdörrar skulle ffa medföra mycket större personalbehov.»
- Bra med stora rum, enkelrum förhindrar viss smittspridning men försvårar samtidigt kontakten med annan vårdpersonal och tror jag fördröjer hjälp vid behov. Skjutdörren tror jag är ett konstigt mellanting men jag har inte arbetat på så många IVOR att jag egentligen kan bedöma det. Man ser ibland sköterskor gå mellan rummen med både förkläde och handskar och då blir man lite rädd. »
- Instängt. Ensamt.»
- Bättre om patienterna ligger på rad ej med fötterna mot varandra. Då ser man den andra patienten när man är hos den ena.»
- Har ej jobbat på annan IVA»
- Bättre såväl medcinskt som socialt för både patient och anhöriga.»
- Lugnare för patienten. Ökad trygghet, när man kan fokusera på en patient. »
- Rummens utformning gör att arbetsmiljön blir bättre då utrymmet runt patienten är väl tilltagna. Utformningen av rummet ger även bra möjlighet att jobba med en av två patienter samtidigt som man har god kontroll av den andre patienten.»
- Har inte arbetat på annan IVA.»
- Bättre. Större rum och större möljighet till privat miljö för patienterna. »
- Skillnaden tidigare har varit att dörrar mot korridoren varit öppna vilket ger sämre patientmiljö men förbättrat sammarbete med personal i korridoren som har större inblick. Nu krävs en aktiv handling för att ta del av verksamheten på rummet. Mycket svårare att övervaka 2 patienter eftersom de ligger längre i från varandra och att man ofta har ryggen mot den patient man inte sköter. Långt att ta sig mellan sängarna när det händer ngt akut. Svårt att höra den patient man inte vårdar för tillfället. Känslan är att man lämnar en patient utan tillsyn när man tar hand om den andre. Detta har jag inte upplevt tidigare när jag arbetat med patienter på dubbelrum, då hade man "kollen" på båda samtidigt.»
- Det är allt för många år sedan för att vara relevant»
- Ja,på IVA i U-a. Mindre enhet,6 IVA-platser på avd. Två sängar stod mitt emot varandra i rummet,ingen skölj på rummet. Var

trångt och ej bra ur hygiensynpunkt. men lätt när man behövde hjälp,bara öppna dörren och ropa så kom någon.»
- Med tanke på hygien och integritet är detta bättre. Men med tanke på arbetsmiljö är det sämre för oss. Man känner sig isolerad. Det är ibland svårt att få hjälp. Det blir inte det samarbetet vi har haft tidigare när vi jobbade i mer öppen miljö. Man jobbar mera själv/ensam.»
- För patienterna bättre - för personalen sämre.»
- Jag gillar våra enkelrum!»
- Mer instängd sämmre möjlighet att snabbt få hjälp. Bättre patientmiljö och anhörigmiljö. Tystare lugnare bättre avskärmning»
- Jättebra för patienten, blir lugnare för dem och för anhöriga, men en försämring personalmässigt då det rä svårt att få hjälp. Skule något hända på rummet är man väldigt sårbar.»
- Förut hade vi dubbelrum men ingen dörr emellan,närmare till båda patienterna och mer öppet då.»

10. Övriga kommentarer om patientrumsmiljön?

- Jag tror mer på en öppen planlösning mer än enskilda rum. Det drar för mycket personal!»
- -»
- Rummet känns vitt och sterilt, i förbättringsfas kanske patienten mått bra av lite mer stimuli?»
- Färgerna tycker jag är för kalla, mycket ljusgrå, ljusblå.»
- Ljust luftigt överskådligt.»
- Fina och bra rum - gillar att jag kan använda pendlar.Är frächa och stora rejäla.»
- Om dörrarna hade en fönsterdel i övre hälften, tex, kunde man viftar...»
- 1. För mycket och för högt larm, se ovan. 2. Dålig arbetsmiljö pga sättet som arbetsmaterial och utrustning är placerad på pendlarna. T ex handskarna som ändå ska avändas vid många åtgärder ä placerad på baksidan av pendlarna.»
- Sköterskorna vädrar ofta ut rummen helt otroligt mycket spec inför ankomst av ny patient har de öppnat utedörren på vid gavel och det är typ 15 grader inne på salen. De ursäktar sig med att patienten är septisk och för varm men jag tycker det är oacceptabelt. Vi kan inte ha 15 grader inne på en IVAsal ens 10 minuter. »
- Sterilt. Kallt atmosfär. »
- Gardinerna bra och snygga men för få, det ska vara flera för att vara ok.»
- Anser att detta är bästa möjliga miljö för såväl patient som ev anhöriga. För optimalt omhändertagande av pat. krävs "rätt" bemanning, som kan variera. Flexibilitet. Kan vara personalkrävande, men med all rätt. »
- Tyvärr är rummen för kalla i färgerna och gör miljön opersonlig och steril. detta speciellt för anhöriga men även för mig som personal. »
- Svårt att få in dagsljus. Man ser inte himlen från vissa rum om du inte lutar dig mot fönstret. Hög ljudnivå personalen emellan + ständigt surrande från patientsäng, respirator och annan teknisk utrustning.»
- En stor fördel med att jobba i dessa moduler är att det inte går att bli överlastad med fler patienter än två. I en torgmiljö är det lättare att "ta på sig ansvar" för fler patienter t ex vid lunchavlösning osv men som människa kan jag då inte ge god och säker vård och övervakning. Miljön säkerställer bemanningen då de inte kan planera att jag som sköterska tar ansvar för fler än två salar.»
- Tror vi inte utnyttjar deras fulla kapacitet då vi ofta gör spå samma sätt, sängen åt samma håll etc för alla patienter oavsett sjukdomstillstånd och behov. »
- Bra utrymme.Innomhustempraturen styrs centralt på alla rum.du får ringa och det tar minst en dag att få någon ändring. Kallras på vintern från fönsterväggen.»
- Bra med stora rum så att man kan jobba runt patienten. Bra med stora fönster ut. Tyvärr är det inte så lätt att mörklägga med den typen av dörrar ut till gården. Bra med fönster mellan rummen, bättre möjlighet till övervakning om man jobbar i den andra salen. Men samtidigt svårt att mörklägga om man har en patient som ska sova och man håller på att jobba med den andra patienten och behöver bra belysning.»
- Sköljarnas dörrar har fönster vilket gör att ljuset stör nattetid, även då dörren är stängd. Svårt att få kontakt med personal i korridor om man inte kan komma åt en assistansknapp.»
- Tycker detta är mycket bättre ändå framför allt för patienterna»

Tack för din medverkan!

Exportera denna data till annat program

Ta fram avancerad statistik med filtrering

Appendix 5

CHALMERS
KURSUTVÄRDERINGAR

Visa resultat

Här kan se resultatet från utvärderingen och exportera statistiken till ett annat program. Det går också att göra en enkel filtrering genom att klicka på svarsalternativen och kommentarerna eller en avancerad filtrering genom att använda knappen längst ned.

Tillbaka till huvudsidan

Visa jämförelsestatistik

IVA Miljöenkät - Kungälv

Status: Avslutad
Öppen för svar: 2012-12-03 - 2012-12-06
Antal svar: 21
Procent av deltagarna som svarat: 42%
Kontaktperson: Michael Apple»

Del 1 : Bakgrundsfrågor

1. Din yrkesutbildning

21 svarande

Läkare»	3	14%
Sjuksköterska»	11	52%
Undersköterska»	7	33%
Sjukgymnast»	0	0%

Genomsnitt: 2.19

- *SSK + VUB»* *(Sjuksköterska)*
- *2-årig vårdlinje»* *(Undersköterska)*

2. Är anställd sedan

20 svarande

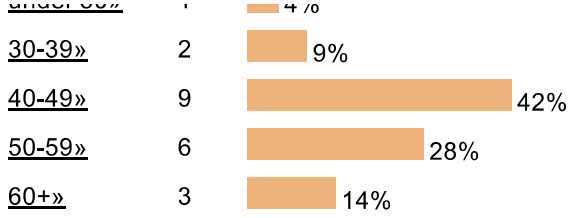
mindre än 1 år»	0	0%
1-3 år»	7	35%
4-10 år»	5	25%
11+ år»	8	40%

Genomsnitt: 3.05

3. Din ålder

21 svarande

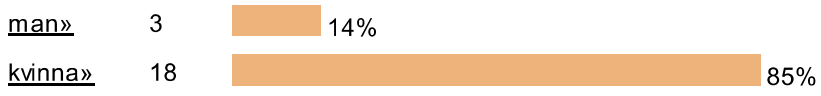
under 30»	1	4%



Genomsnitt: 3.38

4. Kön

21 svarande



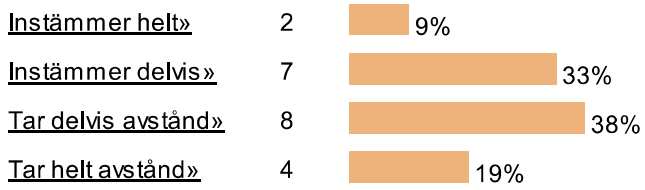
Genomsnitt: 1.85

Del 2 : Utformningen av patientrum: Enkelrum

5. Enkelrum

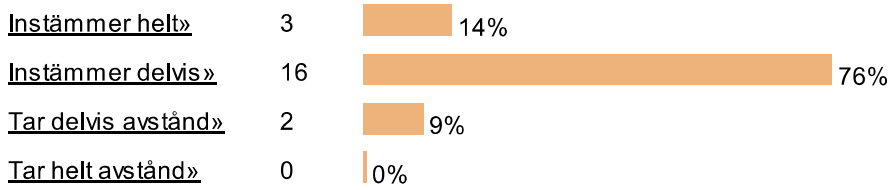
Matrisfråga

Utformningen av enkelrummen ger möjligheter för patienter att ha utsikt över utomhusmiljön.
21 svarande



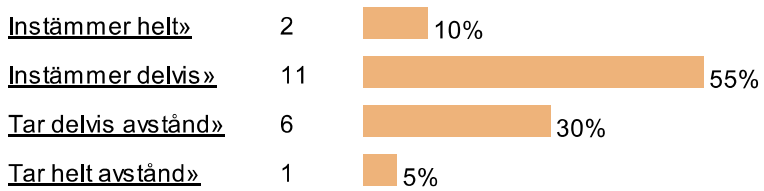
Genomsnitt: 2.66

Utformningen av enkelrummen stödjer mobilisering/rehabilitering av patienter.
21 svarande



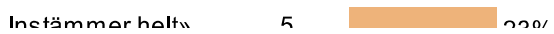
Genomsnitt: 1.95

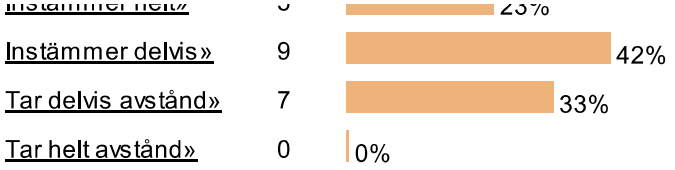
Utformningen av enkelrummen stödjer patientens orientering av tid, plats, och person.
20 svarande



Genomsnitt: 2.3

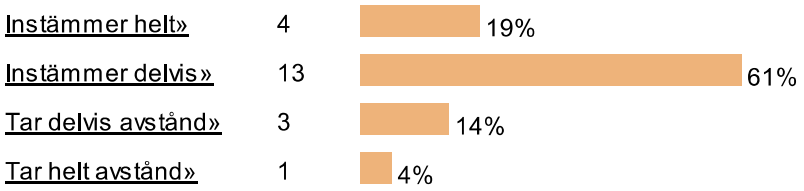
Utformningen av enkelrummen ger adekvat dagsljus.
21 svarande





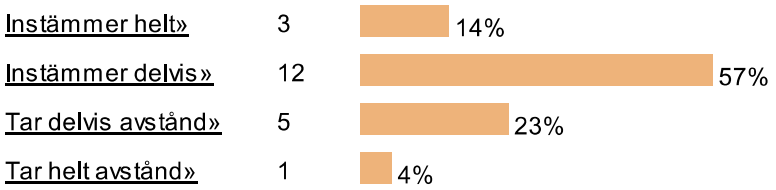
Genomsnitt: 2.09

Utformningen av enkelrummen ger adekvat möjlighet till kontroll över miljön (t.ex. ljus, temperatur, utrustning)
21 svarande



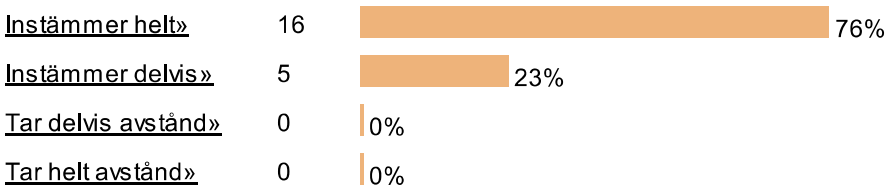
Genomsnitt: 2.04

Utformningen av enkelrummen är inbjudande för närstående och ger plats att kunna vara delaktiga.
21 svarande



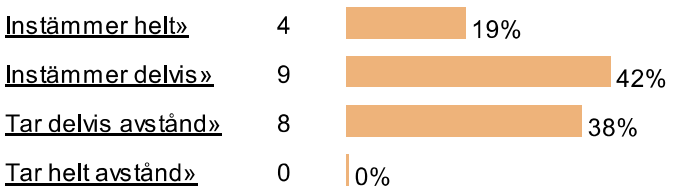
Genomsnitt: 2.19

Utformningen av enkelrummen möjliggör privata samtal.
21 svarande



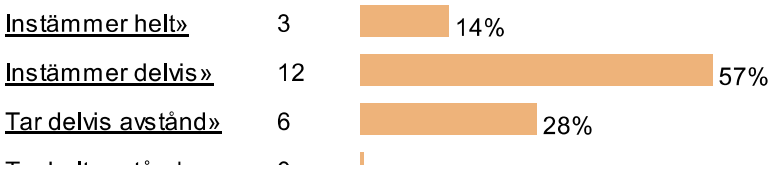
Genomsnitt: 1.23

Utformningen av patientrummen (stämning, känsla, utseende) är tilltalande.
21 svarande



Genomsnitt: 2.19

Utformningen av enkelrummen i förhållande till övervakningsplatsen möjliggör samarbete för personalen.
21 svarande



Tar helt avstånd»	0	0%

Genomsnitt: 2.14

Utformningen av enkelrummen i förhållande till övervakningsplatsen möjliggör effektiv tillsyn av patienten.
21 svarande

Instämmer helt»	1	4%
Instämmer delvis»	13	61%
Tar delvis avstånd»	5	23%
Tar helt avstånd»	2	9%

Genomsnitt: 2.38

Del 3 : Utformningen av patientrum: Dubbelrum

6. Dubbelrum

Matrisfråga

- *Kontroll...för vem? Svorel gäller ur patientsynvikel.»*

Utformningen av dubbelrummen ger möjligheter för patienter att ha utsikt över utomhusmiljön.
21 svarande

Instämmer helt»	15	71%
Instämmer delvis»	4	19%
Tar delvis avstånd»	2	9%
Tar helt avstånd»	0	0%

Genomsnitt: 1.38

Utformningen av dubbelrummen stödjer mobilisering/rehabilitering av patienter.
21 svarande

Instämmer helt»	14	66%
Instämmer delvis»	7	33%
Tar delvis avstånd»	0	0%
Tar helt avstånd»	0	0%

Genomsnitt: 1.33

Utformningen av dubbelrummen stödjer patientens orientering av tid, plats, och person.
21 svarande

Instämmer helt»	7	33%
Instämmer delvis»	12	57%
Tar delvis avstånd»	1	4%
Tar helt avstånd»	1	4%

Genomsnitt: 1.8

Utformningen av dubbelrummen ger adekvat dagsljus.
21 svarande

Instämmer helt»	19	90%

Instämmer delvis»	2	9%
Tar delvis avstånd»	0	0%
Tar helt avstånd»	0	0%

Genomsnitt: 1.09

Utformningen av dubbelrummen ger adekvat möjlighet till kontroll över miljön (t.ex. ljus, temperatur, utrustning)
21 svarande

Instämmer helt»	10	47%
Instämmer delvis»	9	42%
Tar delvis avstånd»	1	4%
Tar helt avstånd»	1	4%

Genomsnitt: 1.66

Utformningen av dubbelrummen är inbjudande för närstående och ger plats att kunna vara delaktiga.
21 svarande

Instämmer helt»	7	33%
Instämmer delvis»	9	42%
Tar delvis avstånd»	5	23%
Tar helt avstånd»	0	0%

Genomsnitt: 1.9

Utformningen av dubbelrummen möjliggör privata samtal.
21 svarande

Instämmer helt»	0	0%
Instämmer delvis»	3	14%
Tar delvis avstånd»	10	47%
Tar helt avstånd»	8	38%

Genomsnitt: 3.23

Utformningen av dubbelrummen (stämning, känsla, utseende) är tilltalande.
20 svarande

Instämmer helt»	8	40%
Instämmer delvis»	10	50%
Tar delvis avstånd»	1	5%
Tar helt avstånd»	1	5%

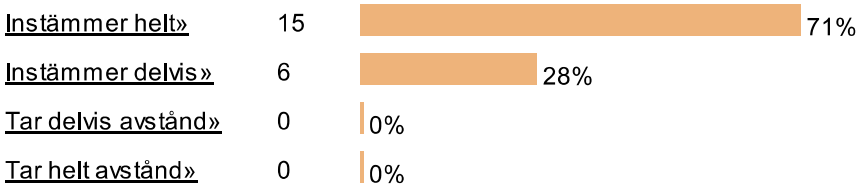
Genomsnitt: 1.75

Utformningen av dubbelrummen i förhållande till övervakningsplatsen möjliggör samarbete för personalen.
21 svarande

Instämmer helt»	13	61%
Instämmer delvis»	8	38%
Tar delvis avstånd»	0	0%
Tar helt avstånd»	0	0%

Genomsnitt: 1.38

Utformningen av dubbelrummen i förhållande till övervakningsplatsen möjliggör effektiv tillsyn av patienten.
21 svarande



Genomsnitt: 1.28

Del 4 : Öppnat svar

7. Hur skulle patientrummen kunna vara mer stödjande för närstående att vara med delaktiga?

- *Vid dubbelrum har närstående mindre integritet när det finns två patienter och flera närstående i samma rum.»*
- *Det optimala, ur patientperspektiv, vore enkelrum. Möjliggör mera privata samtal och ökar den personliga integriteten.»*
- *Större enkelrum skulle underlåtta. »*
- *Det har inte så mycket med rummet att göra, utan kommunikation mellan vårdpersonal och anhöriga. Vi är inte så vana att låta anhöriga vare med.»*
- *vet ej»*
- *Om dubbelrummen var enkelrum»*
- *Bättre fler stolar - beleräkna»*
- *Vet ej Möjligen skönare sitt platser»*
- *Dubbelrummen inskrödyker på anhörigas möljighet att deltaga. Då hänsyn behövs tags till medpatient.»*
- *Större och bättre avskärmning, bättre stolar.»*

8. Övriga kommentarer om patientrumsmiljön?

- *Rör kanske inte patientrumsmiljön men utrymmen, avskedsrum, vissa förråd, vissa kontor, mm är placerade "centralt" fast de kunde placeras mera perifert. Avdelningen blir mkt utdragen och har onödigt långa avstånd. Kan utveckla detta mera i direkt samtal om du önsker...»*
- *Trevlig ljus mijlö. Svårt med sekretess vid flera patienter.»*
- *Utsikten från enkelrummen är en vit vägg.»*
- *Svårt med integritet när 2 patienter ligger i samma rum.»*
- *Patient mycket utsatt för insyn via glasruten till övervaket på plats 6:2 + 7:1. Ej bra nattetid då belysning från övervaket stör patienter på plats 6:2 + 7:1.»*
- *Fantaskiske fönster ut.»*

Tack för din medverkan!

Exportera denna data till annat program

Ta fram avancerad statistik med filtrering

Appendix 6

CHALMERS
KURSUTVÄRDERINGAR

Visa resultat

Utvärderingar

Aktuella utvärderingar
Till min startsida
Hjälpsida
Logga ut

Här kan se resultatet från utvärderingen och exportera statistiken till ett annat program. Det går också att göra en enkel filtrering genom att klicka på svarsalternativen och kommentarerna eller en avancerad filtrering genom att använda knappen längst ned.

Tillbaka till huvudsidan

Visa jämförelsestatistik

IVA MILJÖENKÄT - MÖLNDAL

Status: Avslutad
Öppen för svar: 2012-11-24 - 2012-12-02
Antal svar: 14
Procent av deltagarna som svarat: 21%
Kontaktperson: Michael Apple»

Del 1 : Bakgrundsfrågor

1. Din yrkesutbildning:

14 svarande

Sjuksköterska»	9	64%
Undersköterska»	5	35%
Läkare»	0	0%
Sjukgymnast»	0	0%

Genomsnitt: 1.35

- *Arbetar som instruktör» (Sjuksköterska)*

2. Är anställd sedan:

14 svarande

mindre än 1 år»	2	14%
1-3 år»	3	21%
4-10 år»	1	7%
11+ år»	8	57%

Genomsnitt: 3.07

3. Kön:

14 svarande

man»	2	14%

man»	2	14%
kvinna»	12	85%

Genomsnitt: 1.85

4. Din ålder:

14 svarande

under 30»	0	0%
30-39»	2	14%
40-49»	7	50%
50-59»	3	21%
60+»	2	14%

Genomsnitt: 3.35

Del 2 : Utformningen av IVA patientrum: Enkelrum

5. Design av enbäddsrum:

Matrisfråga

- *Trångt mellan säng och väg i gavlarna ! Ställer sängen på tvärren för att kunna gå runt ordentligt.»*

Utformningen av enkelrummet ger möjligheter för patienterna att ha utsikt över utomhusmiljön.
14 svarande

Instämmer helt»	0	0%
Instämmer delvis»	2	14%
Tar delvis avstånd»	7	50%
Tar helt avstånd»	5	35%

Genomsnitt: 3.21

Utformningen av enkelrummet stödjer mobilisering/rehabilitering av patienter.
14 svarande

Instämmer helt»	5	35%
Instämmer delvis»	8	57%
Tar delvis avstånd»	1	7%
Tar helt avstånd»	0	0%

Genomsnitt: 1.71

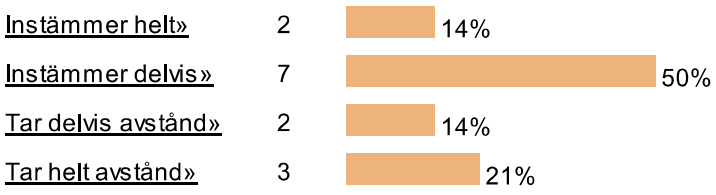
Utformningen av enkelrummet stödjer patientens orientering av tid, plats, och person.
14 svarande

Instämmer helt»	1	7%
Instämmer delvis»	10	71%
Tar delvis avstånd»	3	21%
Tar helt avstånd»	0	0%

Genomsnitt: 2.14

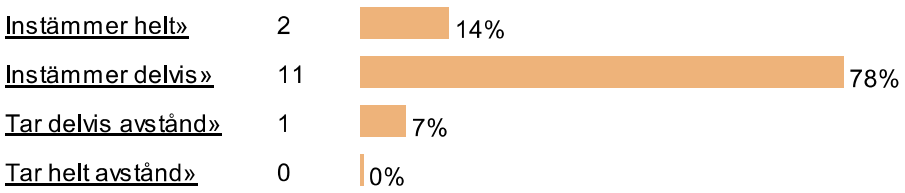
Utformningen av enkelrummet ger adekvat dagsljus.

14 svarande



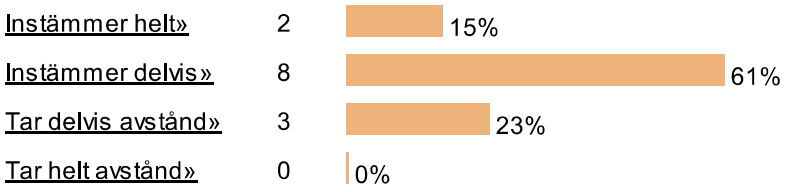
Genomsnitt: 2.42

Utformningen av enkelrummet ger adekvat möjlighet till kontroll över miljön (t.ex. ljus, temperatur, utrustning)
14 svarande



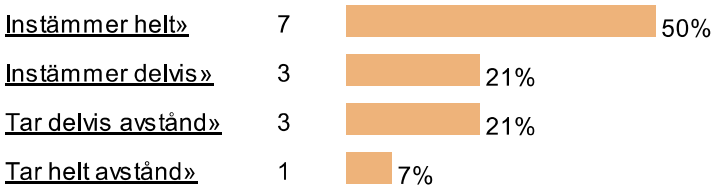
Genomsnitt: 1.92

Utformningen av enkelrummet är inbjudande för närstående och ger plats att kunna vara delaktiga.
13 svarande



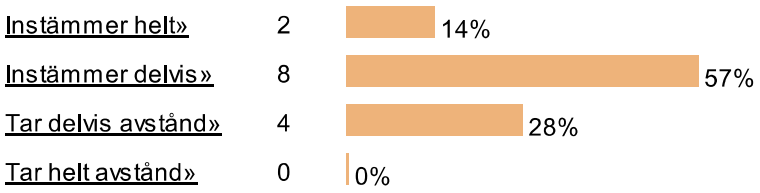
Genomsnitt: 2.07

Utformningen av enkelrummet möjliggör privata samtal.
14 svarande



Genomsnitt: 1.85

Utformningen av patientrummet (stämning, känsla, utseende) är tilltalande.
14 svarande



Genomsnitt: 2.14

Utformningen av enkelrummet i förhållande till övervakningsplatsen möjliggör samarbete för personalen.
13 svarande

Tar delvis avstånd»	2	15%
Tar helt avstånd»	1	7%

Genomsnitt: 1.92

Utformningen av enkelrummet i förhållande till övervakningsplatsen möjliggör effektiv tillsyn av patienten.
14 svarande

Instämmer helt»	7	50%
Instämmer delvis»	4	28%
Tar delvis avstånd»	2	14%
Tar helt avstånd»	1	7%

Genomsnitt: 1.78

Del 3 : Utformningen av IVA patientrum: Dubbelrum

6. Design of tvåbäddsrum

Matrisfråga

Utformningen av dubbelrummen ger möjligheter för patienterna att ha utsikt över utomhusmiljön.
14 svarande

Instämmer helt»	0	0%
Instämmer delvis»	1	7%
Tar delvis avstånd»	6	42%
Tar helt avstånd»	7	50%

Genomsnitt: 3.42

Utformningen av dubbelrummen stödjer mobilisering/rehabilitering av patienter.
14 svarande

Instämmer helt»	6	42%
Instämmer delvis»	7	50%
Tar delvis avstånd»	1	7%
Tar helt avstånd»	0	0%

Genomsnitt: 1.64

Utformningen av dubbelrummen stödjer patientens orientering av tid, plats, och person.
14 svarande

Instämmer helt»	2	14%
Instämmer delvis»	9	64%
Tar delvis avstånd»	2	14%
Tar helt avstånd»	1	7%

Genomsnitt: 2.14

Utformningen av dubbelrummen ger adekvat dagsljus.
14 svarande

Instämmer helt»	1	7%

Instämmer delvis»	5	35%
Tar delvis avstånd»	5	35%
Tar helt avstånd»	3	21%

Genomsnitt: 2.71

Utformningen av dubbelrummen ger adekvat möjlighet till kontroll över miljön (t.ex. ljus, temperatur, utrustning)
14 svarande

Instämmer helt»	4	28%
Instämmer delvis»	7	50%
Tar delvis avstånd»	2	14%
Tar helt avstånd»	1	7%

Genomsnitt: 2

Utformningen av dubbelrummen är inbjudande för närstående och ger plats att kunna vara delaktiga.
14 svarande

Instämmer helt»	3	21%
Instämmer delvis»	9	64%
Tar delvis avstånd»	2	14%
Tar helt avstånd»	0	0%

Genomsnitt: 1.92

Utformningen av dubbelrummen möjliggör privata samtal.
14 svarande

Instämmer helt»	1	7%
Instämmer delvis»	4	28%
Tar delvis avstånd»	4	28%
Tar helt avstånd»	5	35%

Genomsnitt: 2.92

Utformningen av dubbelrummen (stämning, känsla, utseende) är tilltalande.
14 svarande

Instämmer helt»	5	35%
Instämmer delvis»	6	42%
Tar delvis avstånd»	3	21%
Tar helt avstånd»	0	0%

Genomsnitt: 1.85

Utformningen av dubbelrummen i förhållande till övervakningsplatsen möjliggör samarbete för personalen.
14 svarande

Instämmer helt»	8	57%
Instämmer delvis»	5	35%
Tar delvis avstånd»	1	7%
Tar helt avstånd»	0	0%

Genomsnitt: 1.5

Utformningen av dubbelrummen i förhållande till övervakningsplatsen möjliggör effektiv tillsyn av patienten.
14 svarande

Instämmer helt»	12	85%
Instämmer delvis»	1	7%
Tar delvis avstånd»	1	7%
Tar helt avstånd»	0	0%

Genomsnitt: 1.21

Del 4 : Öppnat svar

7. Hur skulle patientrummen kunna vara mer stödjande för närstående att vara delaktiga?

- *Att man skulle kunna dela av så att brevidliggande patient inte störs.»*
- *Det ska ger mer yta till dem att känna sig välkomna. krok för kläder»*
- *kan ej komma på något mer»*
- *Idag finns det inte något eget utrymme i rummet för den anhörig. Ex egen krok att hänga kläder på eller en stol/plats avsedd endast för nästående. Rummen är för små för att ge det utrymmet. Idag får närstående gå ut ur rummet för vi kan inte ge pat avskildhet utan att de närstående lämnar rummet vid omvårdnad.»*

8. Övriga kommentarer om patientrumsmiljön?

- *Fönstren är alldeles för små och dagsljuset kommer inte in på ett bra sätt. Sängarna går förvisso att vrida men förnstren vetter mot en ljusgård.»*
- *Vi har möjlighet att vända sängen så att patienten kan se ut genom fönstret»*
- *Dålig ventilation nattetid. Kallt på rummen nattetid.»*
- *Drar från fläktsystemen (Blåser kallt från taken)»*
- *Svårighet för patienterna att kunna se ut. Att kunna se dagsljus och en himmel tror hjag är viktigt för att kunna orinetera sig till tid.»*
- *Det är på tok för kallt på rummen. »*

Tack för din medverkan!

Exportera denna data till annat program

Ta fram avancerad statistik med filtrering

NÄL IVA Patientrum Miljö Interviews – 27 Nov 2012

1. What is your training/position?
2. How long have you worked here?
3. Have you worked in another IVA before?

4. Some patient rooms have doors to the outside. When do you decide to open the doors?

5. Does the patient have control over some parts of the room environment? (t.ex. light, noise, window, music, photos, mm) What is appropriate?

6. Do you think family members spend more time in the patient room or in the family area?

7. What could be done to encourage family members to be in the patient room more?

8. When do you use the observation room? *(övervakningsrum)*

9. In describing the patient room, some staff have used the words *"isolerad", "instängt",* och *"ensam"*. What is the situation here?

10. I noticed that there is a window between the patient rooms. When do you look through this window?

11. What do you think are the advantages and disadvantages of having the sliding door?

Kungälv IVA Patientrum Miljö Interviews – 28 Nov 2012

1. What is your training/position?
2. How long have you worked here?
3. Have you worked in another IVA before?

4. På vilket sätt hindrar/stödjer utformningen av enkelrummen personalens samverkan?

5. På vilket sätt hindrar/stödjer utformningen av dubbelrummen personalens samverkan?

6. The double rooms have a room for toileting and desinfektion while the single rooms do not. Does this make a big difference to your work?

7. If the patient bed can be rotated within the room, which way is it normally facing? When do you decide to rotate it?

8. There is an övervakningsrum for the enbäddsrummen, and also an övervakningsrum for the dubbelbäddsrummen. What are the differences between these two övervakningsrum?

9. What is family involvement like on the unit?

10. Is family involvement different in the single rooms and double rooms?

Vad tycker du?

Syftet med denna affisch är att du öppet och fritt ska kunna ge dina tanker om fördelar och nackdelar med utformningen av patientrummen.

Vad gillar du med utformningen av enkelrummet?

(skriv här!)

Vad gillar du inte med utformningen av enkelrummet?

(skriv här!)

Vad gillar du med utformningen av dubbelrummet?

(skriv här!)

Vad gillar du inte med utformningen av dubbelrummet?

(skriv här!)

Denna affisch är en del av de studentens forskningsprojektet om utformningen av den fysiska miljön på intensivvårdavdelningen. Målet med detta projekt är att få förståelse för hur vårdmiljön av patientrummet kan bli mer stödjande för patienter, anhöriga och personal. Om du har några frågor, vänligen kontakta Mike Apple på e-mailadress: applem@student.chalmers.se