Safe Patient Handling Equipment Challenges in Inpatient Psychiatric Units: Design Recommendations and Potential Solutions

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***Executive Summary*:**

The area of inpatient psychiatry presents unique challenges to organizations seeking to implement a safe patient handling (SPH) program. With existing equipment such as ceiling-mounted lifts providing opportunities for patients to harm themselves or others, and floor-based or sit-to-stand lifts proving incompatible with the platform beds present in psychiatric units, maintaining a work environment that reduces the caregiver's risk of back and other musculoskeletal injury is difficult. Following a literature search and review on the subject of safe patient handling and psychiatry, a review of environmental design guidelines for inpatient psychiatric units, discussions with clinical staff and experts in this field, and a review of existing patient handling equipment specifically made to be used in a psychiatric unit, it was determined that there were two key areas of equipment development that would be required to meet the safe patient handling needs of this type of unit in and around the immediate vicinity of the patient's bed area. This report highlights the process by which a list of criteria was developed for the design of a height adjustable platform bed that meets the design guidelines for psychiatric units, and a list of criteria that articulates changes that could be made to existing SPH equipment design to meet the needs of this patient group and be compatible with the platform beds used in inpatient psychiatric units.

Contents

1. Background 1

2. Aim of the Project 2

3. Process 3

4. Literature Search and Review 4

5. Existing Design Guidelines for the Psychiatric Setting 6

6. Visiting Inpatient Psychiatric Areas 8

7. Discussions with Clinical Staff Who Work in Inpatient Psychiatric Settings 11

8. Reviewing Existing SPH Equipment Already Available for Inpatient Psychiatry 13

9. Development and Validation of Design Criteria for a Modified Platform Bed and SPHM Equipment for use in a Psychiatric Unit in and around the Bed Area 18

10. Conclusion 22

11. References……....23

1. Background:

As an increasing number of healthcare facilities implement safe patient handling programs in response to either state legislation, to reduce the cost of workers' compensation and associated injury costs, or even on moral grounds, it has become clear that many clinical areas present unique safe patient handling challenges that are not always met with mainstream safe patient handling (SPH) equipment. One of these areas is acute inpatient psychiatry/behavioral health. While states such as New Jersey (2006) require healthcare facilities to establish safe patient handling programs, including their psychiatric facilities, there is very little if any advice given as to how this should be achieved in regard to this particular clinical specialty.

With the patient group in inpatient psychiatric units including mentally unstable patients who are at risk of harming themselves or others, conventional safe patient handling equipment such as ceiling-mounted lifts, which provide ligature attachment points for patients to hang themselves, cannot be installed within their current design and installation specifications. Also, the standard use of fixed height platform beds in these units provides a challenge as existing floor-based lifts and sit-to-stands are difficult to use due to the bed being flush with and bolted to the floor making patient assistance with even the most fundamental Activities of Daily Living (ADLs) a high risk task for their caregivers.

The majority of inpatients in psychiatric units are ambulant and do not necessarily require assistance with ADLs. There is however, a growing trend particularly within the Veterans Health Administration (VHA) to combine acute inpatient psychiatry with advanced dementia care. This patient mix provides conflicting requirements when considering safe patient handling equipment. While one of the most suitable pieces of equipment for a confused or combative patient is the use of a ceiling-mounted lift, it is potentially one of the most dangerous pieces for a suicidal patient.

While a number of patient handling tasks have been identified as high risk to the caregiver in psychiatry (Nelson, 2006) and can be addressed by the use of existing SPH equipment, it is the high risks associated with moving and handling patients in and around the area of platform beds that present the challenge.

Although there have been some modifications to the types of bed design available and early attempts to develop ceiling lifts that are lockable, current safe patient handling practices in an inpatient psychiatric setting are based upon the use of good body mechanics, manual lifting, using existing equipment such as air-assisted devices or floor-based lifts to transfer a patient from the floor after they have fallen, height adjustable shower chairs to assist with showers, and the modified use of existing floor-based lifts and sit-to-stands, with the latter two often creating a greater risk to the caregiver and the patient due to their instability when used with the platform beds.

2. Aim of the project:

The aim of this project was to generate a list of validated design criteria for the development of equipment that could be used in the safe handling of patients in an inpatient psychiatric unit in and around the area of the patient's bed and which would meet the guidelines and mandated requirements for equipment design in this specialist field.

3. Process:

The criteria for the equipment design were determined by:

- Conducting a comprehensive literature search and review of safe patient handling in inpatient psychiatric settings
- Reviewing the existing design and equipment guidelines for psychiatric settings
- Visiting inpatient psychiatric units to review existing SPH practices
- Discussions with clinical staff who work in inpatient psychiatric units
- Reviewing existing SPH equipment already available for inpatient psychiatry
- Formulating a list of design criteria based upon the above
- Validating the criteria with a group of experts in this clinical specialty

The project also took into account previous work conducted by a specialist committee from the VISN 8 Patient Safety Center of Inquiry on this subject.

4. Literature Search and Review:

A literature search was conducted using CINAHL, PubMed, and PsychINFO, as well as a general internet search using Google as a search engine. Reference sections of associated articles were also examined. The key words used either individually or in an appropriate combination were:
psychiatric, psychiatry, safe patient handling (SPH), safe patient handling & movement (SPHM), safety, methods of suicide, inpatient lifts, lifting, guidelines, equipment, beds, causes of staff injury.

No original research studies were found on any elements of safe patient handling and inpatient psychiatric/behavioral health, with minimal anecdotal work available. Due to the lack of literature available the search did not use any date parameters, although any work that was found was generally within the last five years.

However, when the terms *methods of suicide in inpatient psychiatric units* and *psychiatric beds* were reviewed, there was some evidence available that would help inform the design criteria.

Methods of suicide in psychiatric units:

While it is impossible to create an environment that is totally risk free due to the very creative and determined mind set of a patient who is focused on taking his or her own life, the importance of avoiding the introduction of new risks into an inpatient psychiatric unit cannot be overstated. A study conducted on the identification of inpatient suicide hazards in 113 veteran's affairs hospitals identified that the most common was anchor points for hanging, representing nearly 44% of the total number of hazards (Mills et al, 2010). This method of suicide is further enforced by the Office of Mental Health (2009) who, when analyzing the incident reports and root cause analysis of suicides between 2002 and 2008 reported to The Joint Commission as a sentinel event, (their second most commonly reported sentinel event, Ballard et al, 2008) determined that between 2005 and 2008 100% of the hospital inpatient suicides were caused by hanging, with bedroom and bathroom doors being the most common anchor point, and grab rails, a stretcher and a closet door handle also being utilized for this purpose. A variety of recommendations including replacing drop ceilings so that the plumbing/ventilation above was not accessible followed. It is also suggested that psychiatric units/facilities adopt a "Universal Precautions" approach to the risk of suicide (Hunt & Sine, 2009) treating everyone as if they were a suicide risk and making sure all equipment adheres to those preventative standards,

It is clear, therefore, that any potential to increase availability of anchor points for hanging in inpatient psychiatric units, such as the installation of ceiling lifts using their current design and installation technology is not an option. This is also reiterated in recommendations for the coverage of ceiling lifts in various clinical areas where it is clearly stated that "ceiling lifts shall not be installed in mental health units with the potential for actively suicidal patients" (Matz, N.D., p 8).

Bed design in psychiatric units:

One of the challenges to the design of beds, as with any equipment in the psychiatric setting is to reduce the institutional feel and incorporate a home like environment (Karlin and Zeiss (2006). Presently, the majority of beds in these units are the traditional low height box or platform bed, made from either wood or a pre-molded synthetic substance. Hunt suggests that platform beds should not have any storage drawers or exposed wires, springs or restraint loops, and be finished with a wood or wood like appearance in order to be more aesthetically pleasing. He also advocates that the platform beds be firmly anchored to the floor and be of one mold so that liquid cannot penetrate between the joints (Barba, 2010).

While the U.S. Food and Drug Administration (2006) do not address the specific issues of psychiatric platform beds in their report entitled *Hospital Bed System Dimensional and Assessment Guidance to Reduce Entrapment*, the risk to inpatient psychiatric patients of being able to use bed rails as a means of entrapment and death, as well as providing a ligature attachment point is evident in the wider discussions of this document. Therefore, it was determined that bed rails should not be included in any design criteria for this group of patients.

5. Existing Design Guidelines for the Psychiatric Setting:

While there are a variety of different guidelines available for the design and installation of equipment in psychiatric facilities or units, there is little if any mention of safe patient handling within them.

The *Design Guide for the Built Environment of Behavioral Health Facilities* (Sine and Hunt, 2010) provides guidelines for those involved in designing a new building for behavioral health patients, renovating a space, or maintaining an existing behavioral health program. Little reference is made to the challenges of safely moving and handling patients with the exception of a reference to non-adjustable platform beds where it states that "If use of a portable lifting device is needed, these (beds) are available with an opening under the bed to accommodate the legs of the lift" (p29) and refer to the Norix Attenda® Sleigh bed an option to consider.

The guidelines also include recommendations with regard to ceilings which should be non-accessible to the patient, made of solid gypsum with key lockable access to panels (which has implications for ceiling lift installation). Furniture should be bolted to the floor whenever possible, be able to resist being dissembled in order to form a weapon, and must be sturdy enough to withstand abuse (which has implications for the ability of being able to use existing lifts with them, and for the materials the bed is made from respectively). Electrically operated or manually operated traditional hospital beds should have their wheels removed or made inoperable so they cannot be used as a barricade, and traditional powered bed controls or foot pedals should not be used, instead the beds be controlled by "a switch located on the bed rail" (p30) with key lockout switches be used. Also, eliminating the risks to patients of the traditional bed style with headboard, bed rails, and footboard was recommended.

For the first time, the 2010 edition of the *Guidelines for Design and Construction of Health Care Facilities* (Facility Guidelines Institute) has introduced a requirement for project applicants to conduct a patient handling and moving assessment in their design plans and specifications. Guidelines for this assessment are provided in the *Patient Handling and Movement Assessment: A White Paper* (Cohen et al, 2010) which states that:

"Any equipment introduced into the environment of care of a behavioral health unit must be suitably tamper-resistant and compatible with other design choices intended to reduce/eliminate the availability of points of attachment and thus the risk of suicide/self injury." (p32)

The 2010 *Guidelines for Design and Construction of Certified Critical Access Hospitals* also published by the Facility Guidelines Institute, provides guidance for rural hospitals with a minimum of 25 inpatients. There is no reference made to safely moving and handling the patients, but the report does state that "finishes and furnishings should be designed and installed to minimize the opportunity for patients to cause injury to themselves or others" (p16). With regard to ceilings, the guidelines state they should be

on “continuous bonded construction” (p17) as well as indicating that anything attached to ceilings should be tamper-resistant, securely fastened, be unbreakable, and should not allow for the attachment of anything that may cause the patient harm.

This is further supported by Gamble et al (2008) who wrote that when installing any fixtures on the ceilings of adolescent psychiatric units, the fixtures should be “recessed, tamper-proof, and secured with tamper-proof screws.”

Within the Department of Veterans Affairs, the *Mental Health Environment of Care Checklist* (2010) has been used in all Veterans Affairs Mental Health Units since 2007. This checklist seeks to identify environmental safety concerns on locked mental units within the VHA with the purpose of identifying and eliminating environmental risks for inpatient suicide and suicide attempts, as well as making staff more aware of the environmental hazards to patients within this type of unit. The risk assessment is conducted every six months.

Goal fifteen of The Joint Commission's *2010 National Patient Safety Goals* which relates to the identification of safety risks inherent in its patient population makes specific reference to not only identifying the patients who are at risk of committing suicide, but also of conducting an environmental assessment to identify features that may increase or decrease the risk of suicide.

6. Visiting Inpatient Psychiatric Areas:

6.1 VA Facilities:

With little or no literature found from the clinician's perspective of the SPHM challenges in a psychiatric unit, a visit was undertaken to two of the inpatient psychiatric units within VISN 8 with the aim to identify:

1. The client group
2. The SPHM risks experienced by the staff
3. Current SPHM practice
4. Equipment design ideas and solutions

Unit A:

1. The *client group* was predominantly 65 years and older who were either psyco-geriatric, had behavioral health issues, or were a psychiatric risk. Patients with acute medical problems were not accepted into the unit and any patient requiring intravenous drug therapy was transferred to another unit.

2. The *SPHM risks perceived by staff* included the unit having several standard electric hospital beds that were sometimes used for patients who were incontinent of urine and needed regular changing. If a patient was unwell, they would be placed in one of these beds with one on one nursing due to the exposed wires, bedrails, and other ligature and entrapment points on the beds that may enable a potential suicide attempt. There were call lights in every room with a very short cord. The use of the traditional hospital bed did enable its height to be adjusted for patient care and also enabled the mobile lifts to be used.

3. The c*urrent SPHM practice* on the unit included a wide range of patient moving and handling equipment:

- Sit-to-stand – used to assist with cleaning and changing an incontinent patient as well as transferring a patient from the bed/chair/toilet to a wheelchair or other chair. It was explained that the patient had to stretch a long way forward in order for the sling to be positioned because the legs of the hoist could not get close enough to the platform bed which was permanently fixed to the floor.
- Floor-based lift with scales.
- A lift hygiene chair for bathing patients.
- Adjustable height shower chair.

All the equipment was kept in a locked storage room and the patients were never left alone when equipment was being used. On the rare occasion that the patient needed to be laterally transferred from stretcher to bed on admission they would be placed in a hospital bed which could be raised to meet the height of an ambulance stretcher.

4. *Equipment design ideas and solutions* included:

- Electric beds without cords
- Height adjustable box bed - "even if you have a box bed with holes in at the bottom and can use a lift then you still cannot raise the bed so you have to bend down to place the sling on the patient."

Unit 2:

1. The *client group* included those under age 65 requiring acute psychiatric care. No patients requiring IV's would be on the unit but they may receive a patient who is medically ill but suicidal.

2. The *SPHM risks perceived by staff* included patients who required nursing on a traditional hospital bed and who were at risk of access to ligature attachment points due to the wires between the wall and the bed.

3. *Current SPHM practice* included all patients having the standard platform beds unless they were unwell. Wedges were used to raise the head of the bed. SPHM equipment was available.

4. *Equipment design ideas and solutions* included:

- Platform bed that is height adjustable
- Bed that runs on batteries which would be chargeable
- Bed that has a lockable device to stop the patient raising and lowering its height, thus avoiding a potential entrapment risk
- No electric or other back rest that could be raised as if it was let down too quickly the patient could use it to snap their head/neck

6.2 Non-VA Facilities:

Three non-VA facilities were assessed by a professional SPHM expert in 2010. A retrospective audit was conducted on the assessments to determine patient group, SPHM risks and current practice.

Facility	*Patient Group*	*SPHM Risks*	*Current Practice*
Facility One	Bi-polar, experience mania, or have an acute psychiatric illness	Stretcher transfer to the platform bed. Patient has to be physically lifted by 3-4 people as the stretcher does not go low enough and the platform bed does not rise (currently use a backboard with people holding all of the handles). Transferring a patient from bed to wheelchair.	Wooden platform beds with 5 hospital beds if the patient requires assistance with ADLs. No SPHM equipment at this time.
Facility	Suicidal/	Boosting patients	Have a mixture of regular

Two	detox Most of their patients were mobile.	Lateral transfers	hospital beds and platform beds that have an 18” fixed height. Use of gait belts by staff encouraged.
Facility Three	Psychotic, dementia, potential suicidal.	Platform beds do not rise. Furniture is bolted to the floor so it cannot be moved. Helping patients who need assistance with ADLs. Not all of the beds are accessible underneath.	Platform beds that have a cut out that can accommodate the feet of a hoist (but does not allow for movement side to side or widening of the legs of the lift). Two hospital beds that enable staff to raise the patient in the bed to provide care if required. Use body mechanics.

7. Discussions with Clinical Staff Who Work in Inpatient Psychiatric Settings:

Staff from several clinical units, three SPHM Facility Coordinators, a meeting with psychiatric nursing staff at the Orlando SPHM conference, and the psychiatric falls group within VISN 8 VHA were interviewed to determine:

1. SPHM risks
2. Current SPHM practice
3. Equipment design ideas and solutions

It should be noted that patients who required IV therapy would be transferred to another floor which influenced the decision not to place a hole for an IV pole into the platform bed design criteria. The patients the interviewed staff cared for included patients suffering from Alzheimer's and those who required acute psychiatric care including those who were a suicide risk. Some were in the same unit, others were separated.

SPHM risks:

- Sitting patients up in the platform beds.
- Standing patients up from the platform bed.
- Moving patients while they are in the Geriatric chairs.
- The units all had platform/box beds which prevented SPHM equipment being used as they were permanently fixed to the floor.
- Small seclusion rooms that made it difficult for a lift to be used (It was agreed that there would be minimal circumstances in which a lift would be used in these circumstances.).

Current SPHM practice:

- For the majority of units, if a patient became ill or required assistance with ADLs then they would be cared for on a general hospital bed within the unit. This meant one on one nursing due to the risk of wires and other environmental risks and was also very expensive.
- Not all the units had hospital beds and if some patients become unwell, they were cared for on a platform bed.
- The floor-based lift was used at an angle at the bottom of the bed to transfer the patient and then a slide sheet used to reposition the patient higher up the bed. The repositioning up the bed was frequently carried out manually with the caregiver bending down to the low height of the bed.
- Floor-based lifts were used with the platform beds with varying levels of success. One lift tilted towards the patient as its center of gravity shifted when staff tried to position the patient higher up the bed after a transfer and moved the patient, while still in the sling, too far away from the lift.
- Some facilities used transfer belts/gait belts

Design ideas and solutions**:**

- Beds without wires!! Battery pack.
- Beds fixed to the wall.

- Moving the bed away from the wall and having a cupboard behind the bed which stored the SPHM equipment for each patient and was kept locked.
- Ceiling lift track that closes off electronically or electromagnetically and which is tamper proof when not in use.
- Floor-based lift that expands to have a leg on either side of the platform bed and has a non-tipping mechanism so that the patient's weight is distributed to the legs on the lift or "body" of the lift (counter balance technology).
- All the electric components of the bed to be kept under lock and key and only be accessed by clinical staff.
- Height adjustable box bed with the cord under the bed.
- Battery operated bed that would return to charge.

8. Reviewing Existing SPH Equipment Already Available for Inpatient Psychiatry:

When taking into account the literature review, the guidelines, and discussions with clinical staff, it is clear that there are two basic solutions to be considered in order to reduce the risk of back and other musculoskeletal injuries to staff when providing physical care for patients with psychiatric illnesses in and around the patients' immediate bed area:

1. The design of the bed
2. Safe patient handling equipment

A review of the existing beds available for use in psychiatric units and safe patient handling equipment available for this area was conducted.

1.Psychiatric beds:

Box/Platform beds:

A variety of platform or box beds are available, none of which are height adjustable. The most common one to be found in the areas reviewed in this project was the Norix Attenda® Floor Mount bed (Figure 1).The arched areas are closed in but accommodate the bolts required to permanently fix it to the floor. The bed is molded in a high impact polymer and filled with rigid structural foam.

Figure 1: Norix Attenda® Floor Mount Bed

Standard wooden platform beds were also seen, more often in the private hospitals, such as the one in Figure 2. This platform bed has a more homely feel to it, particularly due to the indented base board but still maintains the security of being bolted to the floor.

Figure 2: Standard Wooden Platform Bed

Platform beds were also seen with two holes on either side that enabled the legs of a floor- based lift to be placed under the bed itself. This did not, however, enable the leg base to be widened nor did it enable the position of the actual hoist to be changed.

The Norix Attenda® Sleigh Bed (Figure 3) enables the use of a traditional floor-based hoist and sit-to-stand to be used. It is a pre-molded design, made of a synthetic material and can be permanently bolted to the floor.

Figure 3: Norix Attenda® Sleigh Bed

The Hill-Rom Harbor Glenn™ (Figure 4) Platform bed is made of solid oak, is water resistant, has tamper resistant fittings, has concealed restraint strap holders, and a water resistant finish. It has the capacity to be fixed to the floor by the facility and by their chosen method. It also has a draw option.

Figure 4: Hill-Rom Harbor Glenn™ Platform Bed

Non- Platform beds:

The Stryker Psychiatric bed (Figure 5) reflects the style of a more traditional hospital bed. While it has tamper proof screws and a permanently fixed headboard and footboard as well as a complete absence of electrical components, its design provides many ligature attachment points. While it has wheels, it also has a stationary legs option that allows the facility to customize the mobility of the bed.

Figure 5: Stryker Psychiatric Bed

At least one other manufacturer produced a bed of a similar design for use in the European market.

2. Lifting equipment:

The only equipment that was found to have been designed for use in a psychiatric setting was in the area of ceiling-mounted lifts.

1. Guldmann have made some adaptations to their existing ceiling lift installations. In Figure 6 the motor and hoist "parks" into a cabinet on the wall and functions with a recessed track.

Figure 6: Guldmann GH3 in cabinet with recessed rail

2. Hill-Rom/Liko is also developing a ceiling lift that could potentially be used in a psychiatric setting but it is still at the conceptual stage and no details are available at this time.

An alternative to a permanently installed ceiling lift is a free standing track system that is portable and that can be used in a patients' room, removed after use and safely stored (Figure 7).

Figure 7: Liko Ultra Twin Freespan Lifting System

This style of lift does, however, require a large locked storage area which may be restrictive for some units.

9. Development and Validation of Design Criteria for a Modified Platform Bed and SPHM Equipment for use in a Psychiatric Unit in and around the Bed Area:

Following the literature review, visits to psychiatric areas, discussions with clinical staff, and a review of the existing equipment, a final list of 14 criteria were identified to guide the design of a height adjustable platform style bed (Figure 9.1) and 5 criteria for the development of safe patient handling and movement equipment. (Figure 9.2)

Figure 9.1

Final criteria for the design of beds in the psychiatric unit:

- No exposed cords/wires from the bed to the wall
- Built in call light
- Height adjustable – electrically operated that would also allow existing SPHM equipment (floor-based lifts and sit-to-stands) to be used with it
- Controls that are inaccessible to the patient
- Bed to be in a zero energy state when not in use
- Needs to remain permanently fixed to the floor
- Should not have any holes in the frame that would allow something to be suspended from it
- Has the capacity to weigh the patient
- Built in bed alarm
- Made of a synthetic substance for easy cleaning and to prevent fluids going into the joints
- Have an option to fix four-point restraints
- No side rails
- No mechanism to raise the head of the bed
- No sharp edges

Figure 9.2

Final criteria for the design of SPHM equipment for an inpatient psychiatric unit:

- Ceiling lift - encased tamper proof track that is only accessible to staff
- Ceiling-mounted lift motor would need to be placed in a lockable cabinet (no sharp corners) while still on the track
- No wires or cords left out that could lead to self harm of patient or others when the ceiling lift was not in use
- Floor-based lift that has a wider leg span without compromising the center of gravity
- Optional: Smaller size lifts due to the very small rooms often found in psychiatric units

The final validation of the design criteria was achieved through a discussion with the original group involved with the preliminary work on establishing the design criteria for SPH equipment in an inpatient psychiatric unit. There was a much longer discussion on the bed design criteria than the SPH equipment as the consensus was that making the bed height adjustable allowing for the lifts to go under it was the optimal solution. It would also mean that existing SPH equipment could be used with it. However, it was also recognized that the new beds could be very expensive and many facilities would not be able to purchase them at the time they became available so another option was to redesign the equipment to suit the existing platform beds.

Rationale for the design requirements for the beds:

- ***No exposed wires on the beds:*** This was expanded to include the word cords. There was a general consensus that the beds did need to be electrical, particularly as some of the patients were becoming much higher acuity and needed more help with ADLs.
- ***Built-in call light:*** While the availability of a call light in an acute psychiatric unit for patient use is not mandated, there was a split within the group as to whether this should be a priority in the bed design. Some units had call lights that were attached to beaded cords that were easily breakable, while others only had call lights in bathrooms. It was felt that due to the requirement to conduct 15 minute rounds, call lights were not always helpful as staff would see the patient regularly and some patients held the call lights on permanently even when they did not require help. It was ultimately felt that the call light should be available on the bed but that it should have a switch that would make it optional for use. There was an extensive discussion about how the call light would be activated including "clap on - clap off" and voice recognition software. It was agreed that a system that monitored the patient's conversations built into the bed was not an option. This had already been trialed in one area and was considered to be a breach of confidentiality and privacy.
- ***Height adjustable (electronically operated) with controls that were inaccessible to the patient.*** This was considered the most important adaption to the existing platform beds and a huge contribution to being able to avoid injury when caring for patients, particularly for those patients that required assistance with feeding or were incontinent. A variety of methods for raising the height of the bed were identified including a hydraulic system that was similar to that of a car lift, a "pitless' cylinder, or a scissor lift similar to that applied to ambulance stretchers. If a hydraulic lift system was used, the frame of the bed would fit over the top and the hydraulic system would be fixed to the floor to meet the requirements of the environmental design guidelines. Another option discussed to raise the bed would be compressed air, similar to the approach used in Formula One racing to lift the car in a pit stop. There would be 4 leg pistons fixed to the floor so that when the bed was lowered the bed would stay tight and flush with the floor.

As the bed would only be raised when a caregiver was present this was felt to be appropriate. Between use it would fit flush with the base of the floor. This design would also allow a traditional floor-based lift or sit-to-stand to be used when the bed was raised. Discussions on the idea that an internal section of the bed would rise within the fixed base concluded that on descent the bed would have the potential to trap the bed linen and pinch the patient so it was rejected as an option.

- ***Controls that are inaccessible to the patient:*** This would be a key/key pad operated switch that would enable the bed to move up and down. The bed would also need to be in a zero energy state when not in use.
- ***Needs to remain permanently fixed to the floor:*** This would meet the requirements of having minimal furniture freestanding in the room that could be used to barricade doors.
- ***Should not have any holes in the frame that would allow something to be suspended from it:*** Agreed by all.
- ***Has the capacity to weigh patients and have a built in bed alarm:*** It was discussed that technology (Load Cell) already available could be incorporated into the bed design. It was agreed that the weighing option would be appreciated if it could be achieved in a safe way but was not regarded as essential.
- ***Be made of synthetic based pre-molded material to prevent fluids going into the joints.*** It was suggested within the review group that a polypropylene type material was used rather than a nylon based which may peel or a PVC which could be splintered and used to self harm.
- ***Have an option to fix four-point restraints:*** This would need to be an option that was ligature attachment resistant. The method of installing a system that resembled a seat belt system , with the female part of the system being installed in the bed was discussed and agreed as an option.
- ***No side rails:*** Due to the ligature attachment and entrapment risk.
- ***No mechanism to raise the head of the bed:*** It was felt that this would provide a point of ligature attachment when raised and also a place for the patient to trap their head under in order to self harm, as it would not be feasible to encase the area behind the raised bed head. The existing system of using wedges or using mattresses with built in wedges was felt to be safe, although it was agreed that the vendors could be asked to look at developing a mattress that was inflatable as an adjunct to this project.
- ***No sharp edges*** by which the patient could harm themselves.

Rationale for the final criteria for the design of SPHM equipment for an inpatient psychiatric unit

- ***Ceiling lift track:*** There was much discussion about whether there should be a ceiling lift designed for psychiatry. It was agreed that it could be a feasible option for some patients. The crucial element would be that the track would need to be fitted so tightly and securely to the ceiling that there would be no way for the patient to tamper with it or use it as a ligature attachment point. It would need to be encased in a box/soffit that would be fitted flush into the ceiling or into a pre-

molded ceiling. A fixed ceiling-mounted lift that closes off when not in use either electronically or electromagnetically and that is tamperproof was also discussed.

- An alternative to the ceiling lift track was to use a gantry housed lift which would be able to be rolled into the room when required. This did, however, pose two problems - storage, and access, as some of the platform beds are installed flush to the wall thus denying access to the lift on both sides of the bed, preventing its use.

- ***Ceiling-mounted lift motor:*** Accessibility of the motor would be important to the staff therefore it was felt that the motor should not be removed from the track. However, it would clearly need to be locked away when not in use and it was felt that this could be achieved through a lockable cupboard fixed onto a wall at the end of the track.

- ***No wires or cords:*** As these would be considered potential ligature points.

- ***Wider leg span on the floor based lifts:*** As the existing platform beds are permanently fixed to the floor, floor-based lifts and sit-to-stands are unable to be used effectively as their legs cannot be pushed under them. Several staff have utilized existing lifts but have found this puts the patient at risk due to the shift in the lift's center of gravity. It also means that the patient has to lean/stretch forward when applying the slings, particularly with the sit-to-stands making them uncomfortable to use. Even the beds that have holes to accommodate the lift's legs are either not height adjustable and have a head and footboard on them or the holes do not enable the feet of the lift to extend or for it to be moved up and down the bed.

- ***Consider a smaller size lift:*** This criteria related to a discussion on the use of equipment in some of the seclusion rooms which are very small and the occasional small patient rooms. There was a general feeling that a patient who had been placed in a seclusion room was likely to be mobile but on the rare occasion that the patient was calm and perhaps needed assistance from the floor, it was suggested that a narrow air-assisted device such as a HoverJack be developed with only two chambers (for speed of inflation) could be an option to accommodate the often very small rooms or limited space to maneuver. While the size of the equipment is listed it is not crucial to the development of the solution and has therefore been identified as optional..

10. Conclusion:

With SPH still a relatively new aspect of healthcare in the United States, it is clear that little consideration has been given to the specific SPH needs of the inpatient psychiatric unit and their client group at this time.

This project has identified that there are two solutions to reducing the risk of caregiver injury when caring for the psychiatric patient in and around the immediate area of their bed. The first is through the further development of platform beds that are height adjustable and which will allow existing SPH equipment to be used with them, and secondly, for design modifications to existing SPH equipment that enable them to be used with the existing platform beds.

The criteria that have been developed in order to inform these developments represent the views from the literature, credible organizations, experts, and, just as importantly, the clinicians whose expertise in the field of psychiatric nursing and environmental design is invaluable. Once presented to equipment engineers and designers, it is hoped that they will make the necessary changes to the bed and lifting equipment in order to help eliminate the patient handling risks to caregivers associated with caring for the psychiatric patient who requires assistance with ADLs in an inpatient setting.

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