to ensure their safety and provide an indication to caregivers monitoring patients at night that a patient is toileting. To ensure that proper illumination levels are achieved to prevent trips and falls, nightlights that are photosensor-controlled may also be used.

- A separate switch should be used for the shower light. Occupancy sensors are not recommended for control of these lights, as movement behind a shower curtain may not be detected.

- Light fixture placement should be coordinated with the location of shower curtains and bariatric lift tracks that extend into toilet rooms (see **Figure 44**).

- The location of ceiling-mounted lights should be coordinated with bathroom exhaust-fan placement.

- Some prepackaged shower enclosures come with ceiling panels and lighting; the designer should coordinate the lighting with the shower specification.

Figure 44. It is important that the ceiling lighting be coordinated with the location of bariatric lift tracks, which can run from patient room to bathroom to reduce the likelihood of falls during bathing and toileting. (Anton Grassl/ESTO)

- Luminaires with a minimum rating of IP44 should be used in shower areas.

8.1.2 Airborne Infection Isolation Room (AIIR) and Protective Environment (PE) Rooms. Entry to these rooms is restricted when the room is in use for an AIIR or PE patient, creating additional obstacles for servicing lighting equipment. Luminaire light source selection should maximize lamp life and provide some form of redundancy to prevent complete failure, which would necessitate moving the patient. Unlike typical patient rooms, these rooms do not contain family zones and contain vestibule air locks for donning and discarding protective clothing. Illumination recommendations found in **Section 3.3.1, Table 2**, identify these special patient care room types as "Isolation Rooms." AIIR and PE rooms share many common lighting features but function in distinctly opposite manners, as described below:

- Airborne Infection Isolation Rooms (AIIR):
  Airborne Infection Isolation Rooms are used to prevent the spread of airborne infectious diseases to other areas of the healthcare facility. Healthcare facilities typically perform an assessment using the standards in the FGI Guidelines to determine the number of isolation rooms in various departments and services within the facility. Luminaires in isolation rooms need to be sealed to prevent particulate transmission and support the ventilation system's room pressurization and shall have an IEC Ingress Protection rating of IP64 or higher. Negative pressurization is maintained in these rooms to prevent airborne contaminants from causing risk to other patients in the area. Luminaire housings should be hole-free sealed troffers that maintain a sealed separation between the room and ceiling plenum. Additionally, for the safety of maintenance personnel, the luminaire doorframe should seal to the fixture flange, and the lens should be sealed to the doorframe. This construction seals the face of the luminaire in the ceiling, preventing infectious pathogens from accumulating within the fixture, and greatly assists the ventilation system in maintaining the room's negative air pressure.

- Protective Environment (PE) Rooms:
  Protective Environment rooms are used for patients with compromised or suppressed immune systems, such as patients who have recently undergone bone marrow transplants. Positive pressurization is maintained in these settings to avoid airborne contaminants from

entering the room. Luminaires in these isolation rooms need to be sealed to prevent particulate transmission and support the ventilation system's room pressurization, and therefore shall utilize an IEC Ingress Protection rating of IP64 or higher. The luminaire doorframe should seal to the fixture flange, and the lens should be sealed to the doorframe. Field applied caulking seals the recessed housing flange to the ceiling, maintaining the integrity of the ceiling separating the room from the plenum.

Control devices should withstand regular cleaning methods as well as decontamination methods (refer to **Section 4.3.3 Room Decontamination Methods**). Manually operated controls may be preferable over touch screens that may not function when the user is wearing latex gloves.

8.1.3 Critical Care. Patient rooms in the critical care unit may be specifically designed only for critical care or may be a "swing room" or "acuity adaptable," where the room may be used for a general-care patient or for a critical-care patient, based upon the hospital's use needs. Such "swing rooms" should be designed to comply with lighting design considerations for patient rooms in addition to the special requirements identified below that differentiate Critical Care Patient Rooms from standard ones.

In critical-care rooms, patients are not as mobile and may not be as conscious as in general patient care. Patients require more monitoring and support from caregivers and often have more medical monitoring equipment around the bedside (see **Figure 45**). The bed position may be altered from the typical headwall condition due to medical equipment and/or 360-degree access requirements; hence visitor access is often more restricted. Medical gas and related equipment are often implemented through ceiling-mounted booms.

Frequently, an observation light for staff to monitor the condition of the patients is needed; this light should be dimmable and may be the same light used for examination or reading, depending on the configuration.

8.1.4 Obstetrical Units. Labor-Delivery-Recovery (LDR) and Labor-Delivery-Recovery-Postpartum (LDRP) rooms are private rooms that are used for non-surgical births. The layout of an LDR or LDRP room is similar to that of a private inpatient room and typically has a residential, hospitality-like atmosphere in order to provide additional comfort to the patient and family during their stay. The room is large enough to feature dedicated spaces in the room for supportive family members. In addition to the general illumination within the room, high-intensity, articulated, recessed task lighting is located at the foot of the bed to ensure sufficient illumination of the birth canal during labor and delivery. An infant radiant warmer, incubator, or bassinet may also be located in the room, depending on needs of the infant (see **Figure 46**).

Figure 46. This Labor-Delivery-Recovery (LDR) room features dedicated spaces for mother, newborn and visiting family. (Courtesy of HDR; ©2013 balloggphoto.com)

Figure 45. Cancer and critical-care units. (Images courtesy of HOK)

Figure 47. Well-newborn nursery and special care nursery spaces (NMH Prentice Women's Hospital)
(Photo – Hedrich-Blessing left image courtesy of Jeff Millies, right image courtesy of Nick Merrick. OWP/P Engineers/Aurora Lighting Design)

8.1.5 Nursery Units. Newborn babies are cared for in Nursery Units (see **Figure 47**). There are four levels of neonatal care, as defined by the American Academy of Pediatrics. Level III and Level IV rooms are described in **Section 8.1.6 Neonatal Intensive Care Units**. This section refers to Level I and Level II facilities.

- Level I – Well-Newborn Nursery:
  Level I nurseries should have pediatricians, family physicians, nurse practitioners, and advanced practice registered nurses. They should be able to provide neonatal resuscitation at every delivery, evaluate and provide postnatal care to healthy newborn infants, stabilize and care for infants born at 35 to 37 weeks' gestation who remain physiologically stable, and stabilize newborn infants until they can be transferred to higher-level facilities if needed.

- Level II – Special Care Nursery:
  Level II nurseries should have neonatologists and neonatal nurse practitioners. In addition to the care capabilities defined for Level I, these units should be able to:

  - Provide care for infants feeding and growing stronger or convalescing after intensive care
  - Provide care for infants of 32 weeks' gestation or more and weighing at least 1,500 g who have physiological immaturity or who are moderately ill with problems expected to resolve rapidly without the need for subspecialty services on an urgent basis
  - Stabilize infants of less than 32 weeks' gestation and weighing less than 1,500 g until transfer to a NICU
  - Provide mechanical ventilation for up to 24 hours or continuous positive airway pressure

Nursery units have multiple supine newborns that spend much of their time sleeping. Soft, calming ambient lighting is desired. It is also important to remember that there is often a large viewing window where visitors gather to see these newborns. The lighting placement and intensity levels for the nursery should be coordinated with and balanced with the illumination levels in the viewing area on the other side of the viewing glass.

Daylight may have a positive effect: it is often used in bilirubin treatment for jaundice and helps to establish normal day-night circadian rhythms. Electric lighting should be designed to support these day-night cycles. It is important to keep in mind that newborn eyes need protection from direct sunlight, as they cannot yet filter UV wavelengths.

Examination lighting should be circuited to the critical branch of the emergency power distribution system.

It is important to keep in mind that this is a multi-patient critical care environment. The amount of light needed and the task location constantly vary. The skilled nursing professionals in these areas should have complete flexibility in determining illumination level settings. This is most easily done through dimming. Night settings may be used several times throughout the day to encourage the restorative sleep needed by all newborns. The exam illumination level should be independently controlled by a switch located near the designated examination area and easily accessible to the caregiver. The handwashing sink task light may be controlled by a local switch or a proximity sensor.

During viewing hours, illumination levels within the nursery should be higher than illumination levels outside the viewing glass.

8.1.6 Neonatal Intensive Care Units. Newborn babies who need intensive medical attention are cared for in Neonatal Intensive Care Units (NICU). These babies are often housed in isolettes that provide oxygenation, stabilize temperature and humidity, and have provisions for catheters and nasogastric (NG) tubes, as well as monitoring devices.

There are four levels of neonatal care, as defined by the American Academy of Pediatrics. Level I and Level II rooms are described in **Section 8.1.5 Nursery Units**. This section refers to Level III and Level IV facilities.

- Level III – NICU:
  Level III units are required to have pediatric surgeons in addition to neonatologists, neonatal nurse practitioners, pediatricians, family physicians, nurse practitioners, and advanced practice registered nurses. They should also have on-site (or with closely related agreements) pediatric subspecialists, pediatric anesthesiologists, and pediatric ophthalmologists. In addition to the care capabilities defined for Levels I and II, these units should be able to:

  - Provide sustained life support
  - Provide care for infants of less than 32 weeks' gestation and weighing less than 1,500 grams
  - Provide care for infants born with critical illnesses, regardless of gestational age and birth weight
  - Provide a range of respiratory support that may include conventional and/or high-frequency ventilation and inhaled nitric oxide
  - Perform advanced imaging, including computed tomography (CT), magnetic resonance imaging (MRI), and echocardiography

- Level IV – Regional NICU:
  Level IV units are required to have pediatric surgical subspecialists, in addition to all of the medical staffing required for Level III units. In addition to the care capabilities defined for Levels I, II and III, these units should be able to:

  - Provide surgical repair of complex congenital or acquired conditions
  - Maintain a full range of pediatric medical subspecialists, pediatric surgical subspecialists, and pediatric anesthesiologists on site
  - Facilitate transport and provide outreach education

Neonatal intensive care units are the only critical care environment where indirect lighting is recommended to achieve ambient illumination levels (see **Figure 48**). Premature and critically ill newborns are supine and should not have direct views into luminaires, to protect their developing eyes.

Daylight is also beneficial for patients in Level IV units. (Refer to **Section 5.0 Health and Wellness** for research tying daylight to improved outcomes in premature infants.) Daylight helps to establish the day-night circadian rhythm; electric lighting should be designed to support these day-night cycles.

Examination lighting should be circuited to the critical branch of the emergency power distribution system.

The exam illumination level should be independently controlled for each bassinet by a dimming switch located near the headwall of each isolette and easily accessible to the caregiver. Isolette locations should be coordinated with lighting placement and exam light control locations.

Figure 48. Indirect lighting is often used in neonatal intensive care units, minimizing the impact of glare on sensitive infants. (Courtesy of HDR; ©2013 balloggphoto.com)

Figure 49. Lighting emphasizes the colorful finishes and architectural details in this pediatric patient room. (Courtesy of HDR; ©2013 Mark Herboth)

8.1.7 Pediatric Units. Pediatric patient rooms are designed with children and their families in mind. Colors and finishes are often more playful and thematic (see **Figure 49**). Family members are often in the hospital for the full duration of the pediatric patient's stay, sleeping in the room with the patient. Because there will be periods when the patients are alone in their rooms, all fixtures and controls shall be both child-friendly and tamper-resistant.

Like adult patient rooms, there are typically three zones in a pediatric patient room: the patient zone, the caregiver zone, and the family zone. There are varying needs for multiple tasks being performed in the room, including requirements for cleaning. Increasingly, facilities are recognizing the need for 24-hour circadian-supportive lighting schemes. Lighting systems should be able to deliver higher levels of illumination during the day, with a key component being daylight. At night, patients should experience a darker sleeping environment, with night lighting provided to support fall prevention. Nightshift caregivers require sufficient light to perform critical tasks; however, target illuminances for certain tasks can be lower at night than their daytime equivalents.

The lighting needs of the patient also vary, depending on the patient's age and severity of illness. Patients may spend time sitting up watching television, using electronic devices, reading or being read to, and often have designated playrooms to which they may be able to travel for more-active play.

Pediatric intensive care rooms vary from pediatric patient rooms much the same way that adult patient rooms vary from intensive care patient rooms. Unlike adult intensive care rooms, pediatric intensive care rooms should always have some accommodations for family members.

Night lighting for the safety of caregivers and for a patient traversing to the toilet is also an important consideration, and especially for pediatric patients, where night lighting can take some of the fear away from sleeping in a strange place.

Lighting solutions should work with the finishes to create comforting, playful environments that are welcoming to children of all ages (See **Figure 50**).

It is important to keep in mind that while older pediatric patients should be given control of as many environmental factors as possible, for younger pediatric patients these controls should be given to their guardian. Cribs do not include controllers that connect to the headwall. When beds are replaced by cribs, it is important that controls located on bed controllers are also located and labeled on the wall. Anxiety, heightened by feeling a loss of control, can be alleviated by providing patients and guardians with the ability to control certain aspects of their environment.

Older pediatric patients should have control of reading illumination levels via the pillow speaker and/or bed controls. For younger pediatric patients, wall-mounted controllers accessible by family members can help adjust illumination levels when reading to patients.

The family zone should have independent control for visitors utilizing this zone. Family members often remain in the patient room reading or performing other tasks while the patient rests and require different light levels. It is important to provide adequate task illumination without providing vertical surface brightness that could be visible to the patient, and dimming is recommended.

Figure 50. Daylight and views, non-institutional lighting design, and the use of saturated-color ceiling effects make this room inviting and less intimidating for young patients.
(Image courtesy of Anton Grassl/ESTO)

Patient control (as well as control by family and staff) of window shading should be considered. Controls shall be provided to prevent accidental looping hazards.

8.1.8 Geriatric Skilled Nursing Extended Stay. Extended-stay geriatric facilities strive to create comfortable home-like environments that provide healthcare support for multiple patients. These facilities are typically separate from hospitals and do not provide acute medical services. Fall prevention is a primary concern; maintaining clear, illuminated paths between the bed and toilet room is important. There is often a need for medical monitoring devices and oxygen systems as well as clear space around the bed for caregivers to assist patients. Family areas within the room provide spaces that encourage patients to get out of bed, and they enhance visitor interaction.

Higher illumination levels and appropriate contrast ratios are needed to support aging eyesight. Higher illumination levels for visual task performance are needed to accommodate the illumination that is naturally filtered by the eye's lens, which yellows over time. However, if illumination levels are too high, glare can result. As the human eye ages, tolerance ranges for illumination and contrast ratios shrink. Subtle shade variations may go unnoticed. In these instances, increasing illumination levels is not as effective as increasing color contrast.

Circadian disruption has been linked with sleep disorders as well as depression—both common problems with geriatric patients (see **Section 5.0 Health and Wellness**). Lighting should be designed to promote circadian entrainment. Design professionals are encouraged to work with the facility staff to determine how best to utilize lighting to achieve circadian entrainment. Luminaires and light sources that automatically adjust color temperature to simulate a diurnal cycle may be considered. Refer to IES RP-28-16, *Lighting and the Visual Environment for Seniors and the Low Vision Population* for additional details.

The designer should consider integrating design approaches that appear less institutional in nature and create comforting environments, while addressing safety and therapy needs. When designing the lighting system, minimizing large areas of surface brightness and creating task areas within the room that have different illumination levels may create an effect that resembles residential lighting. The design should include the ability to adjust illumination levels at the bed as well as at the seating area, while ensuring that pools of light creating contrast ratios exceeding 20:1 do not result.

Dimming is recommended for these rooms. A light fixture that is not directly over the patient bed should be separately switched at the entry door to allow caregivers to enter the room and check on the patient during sleep. Nightlights controlled by proximity sensors located near the entrance are another method of addressing this need.

Step lighting that illuminates the toilet room and path to the toilet room should be controlled by a photosensor so that it is always on whenever the room is dark.

Lighting in the patient restrooms may be controlled by occupancy sensors so that patients can return to bed at night without having to turn off the light. Sensor placement and sensitivity shall be such that movement outside of the toilet room does not activate the sensor. Shower lights shall be separately switched to ensure that they remain on while the patient is showering. It is important to remember that dark adaptation is slower, and the low-level nightlight in the room may not provide sufficient illumination when leaving the restroom before the lights switch off.

The lighting designer should keep the following recommendations in mind when designing for these spaces:

- Avoid high contrast ratios between face of wall sconce and wall surface.
- Avoid large vertical surface areas of high luminance that may contribute to eye adaptation problems.
- Identify dark finishes, and avoid bright surfaces set against dark backgrounds.
- Limit reflected glare from specular finishes.
- Accommodate the slower adaptation rates of geriatric patients by increasing illumination levels in daylight transition zones.

8.1.9 Psychiatric Units. Psychiatric or behavioral health patient rooms are generally designed to maximize patient safety from a greater risk of self-inflicted harm. As a result, special considerations are given when designing lighting systems for these spaces.

Behavioral health patient rooms are often used for longer duration stays than medical patient rooms. Comforting environments with a sense of privacy are important. Patients are typically ambulatory and encouraged to leave their rooms for therapy and social interaction. It is also important to note that local and state or provincial mental health regulatory agencies may have additional facility design requirements. Design professionals should be aware of all regulatory requirements.

Seclusion treatment rooms are used for short-term occupancy for patients who may be new to the facility or in some state of agitation. These rooms are generally free of furnishings and utilize soft-surface walls and flooring. Luminaires are located in the ceiling outside of the reach of patients.

There are times when psychiatric patients require medical care. These medical care rooms should be designed for the medical needs while addressing the safety requirements described below (see also **Figure 51**).

- All devices should be tamperproof.
- Luminaire construction and mounting should not create ligature (binding) attachment points, should utilize vandal-proof, impact-resistant construction, and should not provide any opportunities for contraband to be concealed.
- Screws should be captive to prevent them from being accidentally left behind after servicing luminaires.
- Polycarbonate lenses are often recommended due to their ruggedness and resistance to breakage.
- The fixture should be secured to the ceiling to prevent its removal by patients seeking a means of self-harm or access into the interstitial space.
- Portable luminaires, such as table lamps, should not be used in these rooms.

Interruptions to circadian rhythms have been linked with depression. (Refer to **Section 5.0 Health and Wellness**.) Lighting should be designed to support circadian health. Design professionals are encouraged to work with the facility staff to determine how best to utilize lighting to achieve circadian entrainment.

When designing the lighting system, the designer should consider minimizing large areas of surface brightness, creating a non-uniformly illuminated room, and providing more illumination at the desk or sitting area and lower illumination levels over the bed.

The use of occupancy sensors or other control devices that contain flashing indicator lights should be avoided. Control strategies should be discussed with medical treatment personnel. Dimming is recommended for these rooms. Switches are often located outside patient rooms. If switching is located within the room, a photosensor-controlled nightlight should be located adjacent to the switch. When switching is located within the room, there is often need for a switch outside of rooms with observation windows to control the nighttime observation light levels. All controls and mounting hardware should be tamper resistant to prevent removal by patients.

8.2 Nursing Units and Support Areas

8.2.1 Patient Corridors. Patient corridors support the flow of medical care and are high-use, multi-functional areas used by patients, staff and visitors (see **Figure 52**). There may be equipment alcoves, and there are often decentralized nursing substations flanking the corridor on either the patient room side or the central-core services side (see **Figure 53**). Lighting of these decentralized nursing substations is discussed in **Section 8.2.2 Nursing**

Figure 51. Behavioral health patient room utilizing tamper-proof security recessed lights and an anti-ligature wall-mounted luminaire for ambient and reading light. (Image courtesy of Kenall)

Figure 52. Linear corridor lighting evokes a sense of flow and movement. Central nursing stations are prominently located on patient floors. (David Sundberg/ESTO)

Figure 53. Decentralized nursing alcoves enable greater proximity to patients, and observation windows provide for increased patient monitoring. (Courtesy of HDR; ©2013 Ed LaCasse)

Stations, but should be considered when designing corridor lighting.

The lighting design for patient corridors should support urgent care needs and provide circadian reinforcement within a facility that is operational 24 hours per day, 7 days each week. Patient corridor lighting design needs to address increasingly stringent energy code requirements, the need for a "daytime" illumination level versus a "nighttime" illumination level, and emergency power requirements for life safety. Equally important is lighting that complements and supports the design aesthetic.

Controls are recommended to be part of the overall building lighting control system, with override switches located at the central nursing station. Override switches may be zoned and should be clearly labeled for intuitive use by staff and emergency personnel.

Since patient rooms are required to have exterior-facing windows, inpatient corridors may have limited access to daylight. Strategies for incorporating more daylight into the corridors include the use of glazing for interior partitions and the use of fenestration at the end of corridors. Glazing on walls and doors of patient rooms reinforces the need to reduce illumination in patient corridors at night.

When designing the lighting, the designer should consider the perspective of the patient when selecting luminaires for patient care corridors. Patients who are being transported on a gurney (wheeled stretcher) may experience discomfort glare when looking directly into ceiling-mounted luminaires. Similarly, patients in wheelchairs will have a different viewing angle of lighting fixtures than those who are walking. As such, designers should evaluate viewing angles and luminous intensities of lighting equipment to ensure patient comfort (see **Figure 54**). Viewing angles from patient beds should also be evaluated where there is glazing on patient corridor walls and doors. Uniformity and glare control are important for fall prevention measures, which are of particular concern in healthcare facilities.

As design becomes less institutional and more informed by hospitality and residential design trends, the use of decorative wall sconces has increased. Care should be taken to select fixtures that can withstand surface decontamination wipe-down, withstand accidental impact, and prevent a direct view of the lamp source from all angles.

Patient floor corridors often have a crowded, congested ceiling plenum space (area above the finished ceiling and below the structural ceiling, provided for airflow). Limitations on recessed fixture depth may be imposed to ensure sufficient clear space for installation and wiring.

Luminaires should be easily serviceable from below without the need to open the ceiling plenum. Control devices should be intuitive for occupants and flexible for the facilities teams to maintain.

8.2.2 Nursing Stations. Nursing stations can be centrally located or decentralized. Centrally located nursing stations are multi-occupant areas that are the hubs from which staff interact with visitors, maintain patient records, collaborate, and monitor

Figure 54. Wall sconces add decorative appeal to this corridor. A "quiet" ceiling is particularly appealing for patients who may be lying prone on gurneys. (Blake Marvin, Courtesy of HKS Architects)

Figure 55. Nursing station, open to corridors, with lighting integrated into the design esthetic.
(Courtesy of HDR; ©2014 Dan Schwalm/HDR)

nurse call stations. These spaces are visually open to the patient corridor (see **Figure 55**). Likewise, decentralized documentation stations are also open to the patient corridor and provide a touch-down surface where staff can update and review patient charts as they make their rounds. Illumination requirements for decentralized nursing stations are the same as for centralized nursing stations.

Control of veiling reflections (see **Annex B – Glossary of Terms**) is an important aspect of lighting design for nursing stations. Laptops, computer monitors, and hand-held electronic devices are prevalent in these areas. The design should complement the patient corridor lighting. Centralized nursing stations should include a focal point visible from access corridors that assists wayfinding but does not visually distract staff seated at workstations. Lighting systems at nursing stations should contribute to the alertness level of staff and be chosen with easy cleaning in mind for infection control, particularly in critical-care environments. Light coves and fixture surfaces that collect dirt and debris should be avoided where they are not easily accessed for regular cleaning.

Lighting systems should be designed to support the functional task needs of the staff while also being responsive to photobiological (i.e., non-visual) needs. Reducing ambient illumination levels at night is one method commonly used to support circadian entrainment. Individually controlled task lighting can supplement illumination levels as necessary; an increase in illumination may temporarily increase levels of alertness. One theory with much ongoing research is that decreasing the color temperature of light at night may also help support circadian entrainment. (Refer to **Section 5.0 Health and Wellness** for information regarding circadian entrainment.) Although we continue to learn more about circadian entrainment, creating day/night cycles that support restorative sleep in hospital settings is difficult. During the night cycle while patients are sleeping, nurses and nightshift personnel need to remain awake and alert. Contributing to this dichotomy is the variable timing of staff shifts and patients' sleep.

Balancing near-field and far-field illumination is critical to prevent eye fatigue as nurses routinely shift focus from monitors and reports (near field) to patient rooms (far field). An illuminance ratio of 10:1 for objects of visual interest supports wayfinding and is typically measured on vertical surfaces.

A programmable control system is recommended to automatically adjust light levels between daytime and nighttime "quiet hours." The use of automatic, programmable controls removes the responsibility for routinely adjusting light levels from staff and allows them to focus on the needs of the patients. Local override switches should be located for easy accessibility by staff. These override controls allow staff the flexibility to adjust illumination between daytime and nighttime levels for medical emergencies or cleaning during hours of reduced illumination.

Proximity sensors used to control task lights improve infection control and enhance energy savings. These sensors should be field-commissioned so that only a person seated at the work surface triggers the sensors. Task light intensity may vary with individual staff preferences and time of day; dimmable task lights address this concern.

Pendant fixtures, if used, should not interfere with nurses' view of patient rooms from seated or standing positions. Fixtures mounted within reach (pendants, sconces, or integrally illuminated casework) should not create hot surfaces that may be inadvertently touched by staff, patients or visitors.

The lighting should be coordinated with architectural and millwork layouts and finishes. Proper lighting strategies should be utilized to mitigate reflected glare on specular surfaces.

Lighting at central nursing stations should be coordinated with the overall wayfinding strategy for the facility.

8.2.3 Medication Rooms. Normally located adjacent to nursing stations, medication rooms are utilized by nursing staff to access stored patient medication. These rooms may contain automated dispensing cabinets and/or medication carts for medication storage; most include a countertop work surface. Reducing medication errors is a primary concern for hospitals, and therefore adequate lighting in medication rooms is a priority. Illumination recommendations can be found in **Section 3.3.1** in **Table 2** under “Support Areas for Patient Care” and identified as “medication dispensing area.” Some specialty treatment rooms also have medication rooms, where medications are prepared and which require higher illumination levels than those referenced above. In these cases, the designer should utilize the illumination recommendations provided under “Pharmacy” in the tables in **Section 3.3.1 Illumination Recommendations for Healthcare Facilities**. Medication preparation areas are further described in **Section 10.2.2 Medication Preparation Areas**.

Illumination and fixture selection should address controlling veiling reflections on medication labels and on cabinets with glass doors. Fixtures should be lensed in order to contain accidental lamp breakage, and for easy cleaning. Uniform illumination is important in order to assist with the speed and accuracy with which tasks are being performed. The lighting layout shall address preventing shadows on work surfaces from shelving and cabinets. Task lighting is often the most energy-efficient method for providing higher work surface illumination.

Occupancy sensors should be utilized in these rooms to save energy and eliminate the need to switch off lights while carrying medications. An additional benefit is that seeing lights turn on increases staff alertness.

8.2.4 Nourishment Areas. Nourishment areas are small pantry areas used by staff, patients, and visiting family members. They are typically located in alcoves off the patient corridor and may offer hot and cold drink selections as well as healthy snacks. They provide an amenity that encourages longer family visits, supports the importance of nutrition in the healing process, and allows staff an easily accessible location for quick nourishment without retreating to an isolated break room. Nourishment stations provide an area for informal interaction and the opportunity to make supportive personal connections. The size and function of these spaces will vary. The lighting design should support the architectural design and intent of the area.

In making fixture selections, a designer should consider the architectural design esthetic as well as the pantry function. Lensed fixtures or fixtures designed to contain potential lamp breakage should be utilized above food and food preparation areas.

Where nourishment stations are incorporated into the patient corridor, the lighting control strategy should be linked to the corridor lighting controls. Task lights, if provided, should be controlled by vacancy sensors or include an embedded occupancy or proximity sensor.

Occupancy sensors should be utilized where nourishment stations are isolated enough from the patient corridor for the sensor to work effectively without false triggers. Lighting used to highlight these amenity locations should remain on with corridor lighting to promote wayfinding.

Illumination recommendations can be found in **Section 3.3.1, Table 2** under “Support Areas for Patient Care.”

8.2.5 Handwashing Stations. Handwashing stations can be located in various places, such as patient rooms, corridors, throughout the facility. This section pertains to the illumination needs for the task area itself, the handwashing sink. Task lighting for these areas should be coordinated with the ambient lighting in the surrounding room or area. Illumination recommendations can be found in **Section 3.3.1, Table 2** under “Support Areas for Patient Care.”

For handwashing stations within patient rooms, the lighting should only illuminate the handwashing area in order to avoid unnecessarily waking sleeping patients. If shelving or overhead cabinets will be placed above the sink, the luminaire placement shall be coordinated to ensure that the sink basin and faucet are uniformly illuminated.

If wall switches are used, the switch should be visible and adjacent to the sink, alerting people to the fact that there is a task light available for use, and clearly visible for housekeeping to routinely clean.

Proximity sensors may be utilized to improve infection control and enhance energy savings. These sensors should be field-commissioned so that only a person standing directly in front of the sink triggers the device.

For handwashing sinks located in exam rooms, the designer should consider placing the switch that controls the higher-level examination light by the handwashing sink, to allow it to be switched on prior to washing hands.

8.2.6 Staff Sleeping Rooms. Hospitals are increasingly providing rooms where staff who work long hours can nap while on breaks or between shifts. Even short naps have been shown to increase alertness levels. These rooms can be small enough to include only a bunk bed, or may be large enough to accommodate a bed, desk, and private toilet.

Lighting requirements should be adjusted to serve the functions of the room.

Multi-bed rooms should be provided with a low-level amber or warm-white nightlight with integrated photosensor control. Providing a low level of pathway illumination allows one person to enter or leave without needing to turn on the room lights.

Vacancy sensors or wall switches can be utilized. The use of occupancy sensors to turn on lights is discouraged. However, nightlights with integrated photosensor control may be used.

Lighting should be coordinated with furnishings so that luminaires are not located in the ceiling directly above a bunk bed.

9.0 DIAGNOSTIC AND TREATMENT AREAS

9.1 Examination Treatment Rooms

Examination treatment rooms are an essential part of patient care. Exam rooms are used for patient/caregiver consultations, visual observation and diagnosis, administration of tests, rendering of treatment, and delivery of patient education. There are several types of examination rooms, but all have three common components: an examination area, a handwashing sink, and a countertop for medical notation or computation.

Reduced light levels ease discomfort and intimidation, and extend the time that patients spend talking with caregivers. Increasing both horizontal and vertical illumination is important for caregivers to perform examinations as well as minor or non-invasive medical procedures. It is important to understand the tasks that will be conducted in examination treatment rooms and adjust the general illumination guidelines accordingly. A combination of ambient, exam, and task illumination may be layered to achieve these goals. Some rooms will be equipped with medical examination task lights and diagnostic equipment with integrated task lighting.

Luminaires within the patient's line of sight should be visually comfortable because during examinations a patient will often be lying down or in a reclining position.

For patient examination, it is important to properly render colors, and the lighting source should have sufficient spectral distribution to do so. Traditionally, with fluorescent sources, a minimum color rendering index (CRI) of 80 has been considered sufficient. At the time of this publication, color rendering index values for solid state lighting technologies have shown great variation with respect to actual source rendering abilities. It is recommended that samples be evaluated by the design team prior to use.

Variable lighting levels, achieved via multi-level switching or continuous dimming, should be utilized for flexibility and energy savings. Lower illumination levels may be used until the caregiver is ready to begin the exam. The higher illumination level for the exam should be enabled prior to handwashing; the exam switch should be located near the handwashing sink. Patient consultations may require a lower level of ambient illumination than that required for patient examination and treatment. Examination rooms should be equipped with occupancy sensors that support automatic-on lighting control, as they are preferable to manual-on vacancy sensors for infection control. Care should be taken when selecting the time delay for automatic-off switching, ensuring that patients who are seated or lying prone do not trigger a false-off from the sensor; a minimum time delay of 30 minutes is generally acceptable.

Where adequate side lighting and/or top lighting is present, daylight harvesting can be utilized to achieve ambient illumination requirements.

9.2 Emergency Department Examination Rooms

The emergency department (ED) of a hospital can be a stressful setting, and the objective is to ensure that visitors to the emergency room (ER) can be assessed and treated in a safe and timely manner. Visitors to the ED are often assessed by a triage nurse prior to intake and registration. The patient is then taken to an examination room, where the caregiver evaluates his or her condition through consultation and testing.

Examination room general lighting may be supplemented by a fixed or portable medical examination light (see **Figure 56**). Examination rooms that are separate rooms may be equipped with occupancy sensors that support automatic-on lighting control (preferable to manual-on vacancy sensors) for better infection control. Care should be taken when selecting the time delay for automatic-off switching, ensuring that patients who are seated or lying prone do not trigger a false-off from the sensor; time delay settings should be maximized.