**Health problem addressed**

Devices used to treat hyperbilirubinemia, characterized by high bilirubin concentrations in the blood. Bilirubin, a product of hemoglobin breakdown, remains in the body until the liver can convert it to a form that can be excreted. Jaundice, a yellowish discoloration of the skin, eyes, and mucous membranes, results when bilirubin levels in the blood are too high. High bilirubin levels can be caused by the inability of an immature liver to process high levels of bilirubin, particularly in neonates.

**Product description**

Phototherapy units consist of a light source and a means of allowing the light to radiate the infant. Devices using overhead lamps can be freestanding on casters, ceiling or wall mounted, or attached to infant radiant warmers or infant incubators; some units have height and hood angle adjustments. Bassinet-style units, in which the infant is placed in a plastic bassinet containing a bank of lights in an overhead case, are also available. Fiberoptic phototherapy pad systems use a tungsten-halogen bulb in a metal case, a flexible fiberoptic cable, and a light-emitting plastic pad. Filtered blue light is delivered from the source through the fiberoptic cable and emitted from the sides and ends of the fibers inside the pad, which is wrapped around the infant.

**Principles of operation**

Visible light, specifically the blue-light wavelengths of approximately 420 to 500 nanometers, photochemically reduces bilirubin to water-soluble products that can be excreted. The peak absorption wavelength at which bilirubin breaks down is approximately 458 nm. By exposing patients to light of this wavelength range, hyperbilirubinemia can be treated. Irradiance level is controlled by light-intensity switches for both overhead lamps and fiberoptic units and by the distance between the light source and the patient. (Decreasing the distance between the patient and the light source increases the irradiance level.) A radiometer with an appropriate bandwidth is used to measure the irradiance that reaches the patient during phototherapy.

**Operating steps**

- Eye mask is placed on unclothed infant and place infant in bassinet.
- Depending on configuration, lamp distance is set depending on intensity of therapy desired, or infant is wrapped in fiberoptic pad.
- Treatment typically lasts 1-3 days.

**Reported problems**

Ultraviolet (280 to 400 nm) or near-infrared (780 to 1,400 nm) radiation must be filtered because at high enough levels, both types of radiation can damage the eyes and skin. Known common side effects of phototherapy include changes in body temperature, insensible water loss, and diarrhea. With fiberoptic units, a blanket can be wrapped around the infant and fiberoptic pad to minimize fluctuations in body temperature.

**Use and maintenance**

User(s): Nurse; clinician; medical staff

Maintenance: Biomedical engineering staff and/or service contract with the manufacturer or third-party organization

Training: Initial training by manufacturer; operator’s manuals; user’s guide

**Environment of use**

Settings of use: Hospital; birthing center

Requirements: Line power

**Product specifications**

- Approx. dimensions (mm): 1200 x 650 x 250 for overhead lamp type; 200 x 350 x 150 for fiberoptic type
- Approx. weight (kg): 36 for overhead lamp type; 2 for fiberoptic type
- Consumables: Light bulbs; disposable pad covers
- Price range (USD): 400-7,600 (2,000 typical); price covers all types and variations
- Typical product life time: 10 years
- Shelf life (consumables): NA

**Types and variations**

- Overhead lamps
- Fiberoptic blanket systems