

The Bilirubin Color Scale: a low-cost device for measuring plasma bilirubin

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Neonatal jaundice is one of the common illnesses found in newborns, with a prevalence of 50% in full-term infants and higher in pre-term infants. Untreated cases can lead to kernicterus (bilirubin encephalopathy) and may result in death. Kernicterus is almost always preventable through bilirubin screening by bilirubin testing devices and the early and aggressive use of effective phototherapy and blood exchange transfusion when phototherapy fails. The bilirubin level is for differentiating physiologic jaundice, which does not require any treatment, from abnormal jaundice, that requires investigation and treatment. Furthermore, it is for planning of appropriate treatment and follow-up to prevent kernicterus.

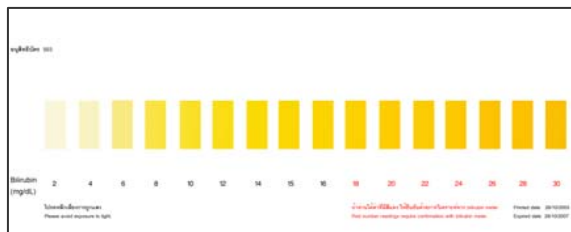
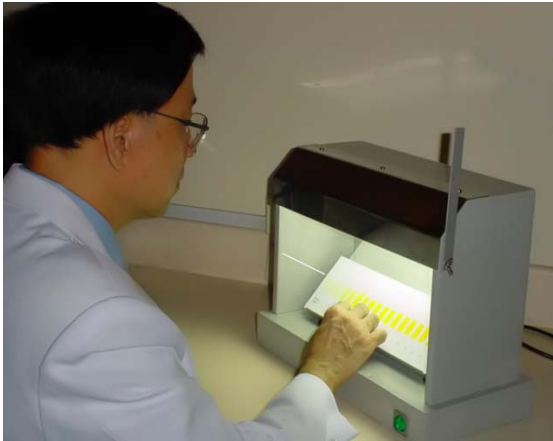
The high cost of an imported bilirubin testing device (200,000 baht) limits the adoption of the device in district hospitals. As a result of budget constraints, the devices are available in

all provincial hospitals but in less than 10% of the 719 district hospitals nationwide which are responsible for 48% of total deliveries annually. When jaundice is detected, either sending a blood specimen for bilirubin measurement or referring a newborn to the provincial general hospital is routinely done. As a result of lack of the device, most newborns are discharged home while severity of jaundice or plasma bilirubin levels are not known. Moreover, healthy newborns of an uncomplicated vaginal birth are usually observed at the hospitals for 36 to 48 hours while bilirubin levels do not peak. If there is a miss in detecting jaundice, a healthy newborn is discharged home without medical follow-up nor home visit by a nurse. This health care practice patterns have risked Thai healthy newborns for kernicterus.

A low-cost (5,000 baht) bilirubin color scale for visual assessment of plasma bilirubin level has been invented by Dr Kriangsak of Siriraj Hospital to compensate for the expensive standard bilirubin tester. The device consists of the bilirubin color scale **and a light booth. The scale has 16 yellow stripes representing plasma bilirubin levels of increasing intensity from 2-30 mg/dL alternating with white areas. The values**

of bilirubin level marked below the yellow stripes are even numbers with only odd number of 15 mg/dL that is in the middle of the scale. The light booth, that has a 10-watt fluorescent tube, is for control the viewing condition. The accuracy of readings when compared to the standard device is ≤ 1.0 mg/dL in 59.94%, ≤ 1.5 mg/dL in 81.37% and ≤ 2.0 in 94.26% of comparisons.

This technological invention will have a huge mass impact in Thailand. It can be useful in screening and monitoring neonatal jaundice and making decisions for management. The device is cheap and easy to use. Not only that it will decrease the incidence of kernicterus in newborn infants, it can also promote parent-infant bonding and breastfeeding. Furthermore it will provide the opportunity for provincial hospitals to develop even more rapidly and lessen government's expense on health care. Finally it will improve quality of newborn care in district and provincial hospitals.



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