

Use of ThermoScan in the District Hospital setting

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Introduction

The busy district hospital at Salima serves a population of 240,000; the 168 beds are often filled by more than 200 patients. The routine temperature round is taken by the three nurses who are on night duty. These nurses are often occupied with deliveries, theatre cases and seriously ill patients. The temperature round is sometimes incomplete and valuable information is missing for the clinical decision makers. The thermoScan is a quick, easy-to-read, heat-sensitive measuring strip (see diagram). We decided to assess the potential use of thermoScans as an adjunct or alternative to mercury thermometers on the wards.

Methods

Observations were made on two different days on 101 patients selected from all the wards. On each day consecutive patients were selected from one half of each ward, omitting those who were critically ill or were occupied with nursing procedures. Each patient had his/her oral and axillary temperatures recorded simultaneously by normal ward mercury thermometers. The thermometers were placed in the axilla and under the tongue for two minutes before being read. During the same two minute period, the temperature was taken using the thermoScan. For each patient this was done five times with five different thermoScans. All readings were done by one observer (AH). The thermoScans (marked ATC 6298) were from a donated source, and had six boxes marked 35°C to 40°C on a flexible plastic strip measuring 9 cm x 2 cm. To record the temperature the thermoScan was held firmly on the forehead for 15 seconds, and the box which turned from black, through blue, to green indicated the patient's body temperature.

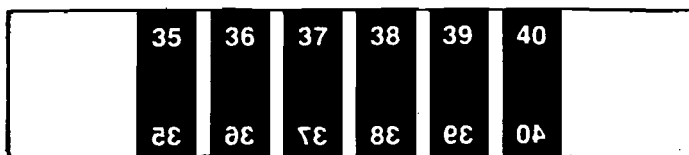


Figure – ThermoScan (actual size)

Results

The oral temperature is a good indicator of core body temperature. Results given by axillary thermometer and thermoScan are compared with the oral temperature in Table 1.

Five different thermoScans were used on each patient to look for reliability of the testing strips. In practice, all five thermoScans gave the same readings. The percentage of thermoScan and axillary temperature readings that differed by more than 0.5°C and 1.0°C from the oral temperatures are shown in Table 1. There was no significant difference between the two methods ($p = 0.89$).

Table 1 Comparison of oral with axillary and thermoScan temperatures

thermometer	ThermoScan n = 101	Axillary n = 101
Oral temperature agrees	70 (69%)	83 (82%)
False positive	27 (27%)	0
False negative	4 (4%)	18 (18%)
Temperature difference 0.5°C	49 (48%)	50 (49%)
Temperature difference 1.0°C	18 (18%)	19 (19%)

* False positive = pyrexia indicated when oral temperature $\geq 37.0^\circ\text{C}$
 ** False negative = pyrexia not indicated when oral temperature $> 37^\circ\text{C}$

Discussion

The thermoScans were easy to use and gave consistent results. There was, however, a high rate of false positives (27%) overall while there were no false positives with axillary temperatures. A retrospective analysis of the data showed that there were more false positives on one day which was subjectively noted to be a particularly hot day (20 out of 44, i.e. 45%). False negatives were rare with the thermoScan (4%). It seems that in very hot weather the skin temperature of the forehead more closely approximates to the core temperature, and the calibration of the testing strip results in an overestimation of core temperature. This inaccuracy would presumably be minimised if thermoScans

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were used during the early morning temperature rounds.

For axillary temperatures there was an agreement of 82% with oral temperature, suggesting a higher predictive value than the 69% by thermoscan. However, axillary temperatures can be unreliable and in our small study they produced 18 (18%) false negatives. This method, which is the normal method used at Salima hospital, will fail to pick up a substantial number of pyrexial patients whose care may be adversely affected. The false negatives were mainly in very thin patients where it is difficult to correctly position the thermometer in the axilla.

The same observer (AH) also assessed each patient subjectively by placing the back of his hand on the chest of each patient before making any measurements. On a hot day 15 out of 44 patients (34%) were incorrectly estimated as pyrexial. There were no false negatives. On a cooler day, by hand testing there were 3 out of 57 false positives (5%) and no pyrexial patients were missed. From this it can be concluded that the thermoscan as a rapid screening test to distinguish a pyrexial patient from one without a fever is no more sensitive than an experienced observer's subjective assessment.

A false negative rate of 4% by thermoscan is better than a rate of 18% by axillary thermometer. If this is confirmed by further studies, a policy of first taking all temperatures by thermoscan and then re-checking all positives with an oral thermometer recording may give the most useful set of observations. Using this protocol with our patients, 4% of true positives would have been missed and 27% of patients would have been found afebrile when checked by oral thermometer. More accurate information would have been obtained, with a reduction in nursing time of at least 50%.

Although thermoscans are cheap and completely safe, they are small and easily lost. Their reliability over time in hot climates needs to be assessed. This study provides some preliminary data to suggest that the use of thermoscans may be preferable to taking axillary temperatures in terms of nursing time and reliability. They have the potential to act as a rapid screen for pyrexia (e.g. during ward rounds) but they may be no more sensitive than experienced clinical judgement. It is possible that the guardian's impression of pyrexia may also be as reliable as the thermoscan. More data is required before thermoscans can be advocated for routine use.

Impregnated bed nets and malaria

Malaria remains a priority disease causing considerable mortality in children in the Gambia and other parts of Africa. As part of a primary health care (PHC) programme village health workers (VHW) were taught how to impregnate bed nets with permethrin. Children aged 6 months to 5 years in these PHC villages were also randomised into a malaria chemoprophylaxis group (maloprim once a week) and a placebo group. 92% of children in these PHC villages slept under these impregnated bed nets. Non-PHC villages had neither intervention although 77% of children in these villages slept under non-impregnated bed nets. Before the intervention mortality was found to be higher in the PHC villages than the non-PHC villages but after the intervention with impregnated bed nets the mortality attributable to malaria was 30% less. The seasonal peak of deaths during the rainy season disappeared after introduction of the impregnated bed nets. Chemoprophylaxis showed no additional benefit to reducing mortality from malaria. The bed nets need to be impregnated once a year and could be a simple measure to introduce as part of PHC to reduce malaria mortality. However it is possible that these findings cannot be extrapolated to other areas where the nature and habits of the mosquito vector may differ, and where bed nets are less commonly used.

Alonso PL, Lindsay SW, Armstrong JRM, et al. The effect of insecticide-treated bed nets on mortality of Gambian children. *Lancet* 1991;337:1499-1502.