Knowledge and Practices on the Usage of Antenatal Colour Coding

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ABSTRACT

Objectives:
The purpose of this study was to assess the staff's and managers knowledge of colour coding system as a risk assessment tool.

Methods:
Self administered questionnaire was used to assess the knowledge and practices of Staff and Managers at hospital maternity unit, nine health and 24 community clinics. Standards and guidelines were set prior to the study.

Results:
Inadequate supply of check-list and colour tag had influenced the usage. Lack of supervision and inadequate knowledge on the doctors who supervised could have affected on the colour coding application especially when there were minimal training. Familiarity with the colour coding system and recurrent practice had enabled the health staff to score better in the colour coding tagging, able to list the essential steps in the application of colour code, able to define coding, high risk, low risk and knew the benefits of risk approach concept.

Conclusion:
The colour coding system would be a good managerial tool, however there were limitations found even at the implementation level.

Key words: colour coding, check - list, guidelines.

Introduction

Colour coding system as a risk approach strategy has been implemented in Malaysia for more than 10 years. However not much evaluation on the implementation of the systems and its effectiveness in the prevention of maternal and perinatal death has been studied.

Technical training is important in providing the skills required by the health staff to detect and identify the risk factors, thus providing an effective referral system for the women at risk.

A study done in Thailand showed that well trained non – physicians such as nurses were able to screen the pregnancy at risk and predict the outcome. Therefore for a program to be successful, it is important that the Staff involved are trained well before implementing the program.

An earlier assessment showed that even the aboriginal health workers in Africa were able to use the risk assessment ‘Antenatal score cards’ to improve the population maternal and child health status.

Accuracy of the cases which were being coded were important factors in determining the pregnancy outcome because according to the system, each different code reflects different management (table 1). Inaccurate history taking, inadequate physical examination and inefficient investigation would influence the coding applied. Upgrading and evaluating Staff knowledge and practice would help in ensuring that the cases were coded accurately. Not only that, knowing when to refer and whom to refer to as what was written in the guidelines would help in providing good pregnancy care and outcome.
Table 1: Management guidelines (Colour coding)

<table>
<thead>
<tr>
<th>Colour</th>
<th>Place of care</th>
<th>Officer responsible</th>
<th>Place of delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Hospital</td>
<td>Specialist / MO (O&amp;G)</td>
<td>Hospital</td>
</tr>
<tr>
<td>Yellow</td>
<td>Hospital / Health</td>
<td>Medical</td>
<td>Hospital Officer</td>
</tr>
<tr>
<td>Green</td>
<td>Health Centre</td>
<td>Nurse / Midwife</td>
<td>Hospital</td>
</tr>
<tr>
<td>White</td>
<td>Health Centre</td>
<td>Midwife</td>
<td>Home</td>
</tr>
</tbody>
</table>

Adapted from: Plan for implementation of checklist for high risk mothers.

An Evaluation by Ministry of Health in 1985 on Staff knowledge and skills provided on high risk mothers was less than 70%. The same evaluation identified that there was not much differences in the knowledge or performance of the different categories of Staff on management provided for high risk mother. The knowledge for the all the categories were about 60% only, with the Public Health sister having the lowest knowledge.

Review of curriculum showed that management of high risk was there before 1985 and the latest curriculum on Antenatal colour coding is being taught at the School of Nursing, throughout the country.

Methods

This study was done in Larut Matang District, involving staff from Hospital either Antenatal wards or clinics, and also from the nine health centres and twenty four Community clinics.

The target population were doctors, midwives and nurses who attended to the Antenatal patients in Taiping hospital (either wards or clinics), and the health centre and community clinics in Larut Matang District. A total of personnel (94 staffs from health side and 78 hospital Staff) were involved in this study. However 16 samples were rejected because most of the questions were not answered.

Self administered questionnaire were designed to assess their knowledge and practise of the colour coding as well as to find the problem face in using this system.

The self administered Questionnaire was prepared and finalised after it was Pre-tested and was then distributed to the nine health centres, 24 Community clinics and Taiping Hospital. Staff were given instruction not to discuss or refer to any guidelines and to contact the researcher if problems occur. A period of one week was given for the staff to complete the questionnaire before collecting.

Standard answers were set before the study;

- Standards taken for tagging of colours was based from the Second edition of Guidelines for management of high risk pregnancy6 and Plan for implementation of checklist for high risk mothers and newborns, May 1989.
- As for standards on application of Antenatal coding the essential steps are;
  i. Get patient particulars by history taking
  ii. Do physical and laboratory examination on patients – weight, height, blood pressure, urine and perform Antenatal examination (foetal heart rate and uterine size)
  iii. Screen through check list
  iv. Apply colour code and stick sticker accordingly

Anything omitted from the above steps were considered as inadequate steps taken for Antenatal Coding. All data were collected and compiled using SPSS program.

Results

The mean working month for the 156 (79 Health: 77 Hospital) staffs was $138\pm9.03$ months (11 years 6 months). Some of the Staff had been working for more than 432 months or 36 years and the minimum working period was less than 1 month. Some of the respondents had been working at both Health side and Hospital. They are familiar with the coding system. One would expect that those working at the health side would have better knowledge in colour coding. However without assessing, the true situation wouldn't be there.

Practice

During the study, staff were asked 'had you used the Antenatal colour coding system before on your patient ?'. 58.4% (84/156) claimed that they had used however 46.2% (72/156) had never used colour coding before; 79.2% (57/72) of those who never used were from hospital. There was significant association found between the place
of working and practised of colour coding (p Value 0.000) (table 2). Those working at health side seem to be using colour coding more than those in hospital.

Coding
On answering this question; "how often do you refer to the guidelines provided by Ministry of health?" 85.7% (72/84) referred to the guidelines often; however 3.6% (3/84) never referred to the guidelines and 10.7% (9/84) staff rarely referred to these guidelines.

94.1% (79/84) of the staff stated that recoding of the Antenatal women were done when changes occurred in during the Antenatal visits. These Staff also claimed that coding was done immediately after taking history and Physical examination. Only 5.9% (5/84) claimed that patient were coded after Clinic session.

On answering this question, "how long do you take to code a patient?" Answered given by the staff varies from two minutes to forty minutes. Mean time taken for coding was 16.1.6. 2.4% (2/84) claimed as 2 minutes; 2.4% (2/84) claimed as 5 minutes; 57.1% (48/84) claimed as 10 minutes; another 20.2% (17/84) claimed as 20 minutes; 10.7% (9/84) claimed as 30 minutes; 7.1% (6/84) claimed as 40 minutes.

Shortage
40.5% (34/84) of those who practiced claimed that shortage in the checklist or stickers do occur and off every 3 to 4 months. 76.4% (26/34) of those who had shortage claimed this were due to lack or no supervision. Only 42.9% (36/84) of those who practiced stated that supervision was done.

To overcome for the shortage of the sticker, they either divided the original sticker into smaller pieces or they either substituted it with coloured paper. Therefore these check list or stickers need to be Photostatted, written manually or indented from the Health office.

Guidelines
88.1% (74/84) staff that practice coding were familiar and were able to name correctly the guidelines

"Guidelines for management of High Risk cases in pregnancy" provided by the Ministry.

As expected 74.5% (62/79) of the health staff compared to only 15.6% (12/77) of the hospital staff were familiar with the above Guidelines. Significant association found between places of working and ability to name the colour coding guideline provided by Ministry of Health. (p value of 0.000). This was expected because health staff used it regularly (table 2).

Table 2: Comparison between Hospital and health Staff in months of working, and Practices of colour coding and ability to name the Guidelines.

<table>
<thead>
<tr>
<th>Months of Working</th>
<th>Health</th>
<th>Hospital</th>
<th>Chi Square</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 12</td>
<td>(25.0%)</td>
<td>(75.0%)</td>
<td>(100.0%)</td>
<td>χ² = 12.75</td>
</tr>
<tr>
<td>12 - 59</td>
<td>(50.0%)</td>
<td>(50.0%)</td>
<td>(100.0%)</td>
<td>p value</td>
</tr>
<tr>
<td>60 - 119</td>
<td>(27.6%)</td>
<td>(72.4%)</td>
<td>(100.0%)</td>
<td>= 0.005</td>
</tr>
<tr>
<td>120 &amp; above</td>
<td>(63.0%)</td>
<td>(37.0%)</td>
<td>(100.0%)</td>
<td></td>
</tr>
</tbody>
</table>

Training
For a person to practise coding on patients effectively they should have training or updated information or both. However during the study it was found that 35.3% (55/156) staff did not have any training or knowledge update on Antenatal coding. Of those
without training, 50.9% (28/55) were health staff and 49.1% (27/55) were hospital staff. For those who had been trained or knowledge update, 50.5% (51/101) were health staff and 49.5% (50/101) were hospital staff. Thus there was not much differences between the hospital and the health staff in the percentage of training received on Antenatal coding.

There were significant association found between years of working (ten years or less and training received by the Staff, (p Value 0.035, Chi square 4.42). Those working less than ten years seems to had been trained compared to those who worked more than ten years (table 3).

Table 3: Association between years of working and training received

<table>
<thead>
<tr>
<th>Training</th>
<th>Less than 10 years</th>
<th>More than 10 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>23 (41.8%)</td>
<td>32 (58.2%)</td>
<td>55</td>
</tr>
<tr>
<td>Trained/Update</td>
<td>50 (59.4%)</td>
<td>41 (40.6%)</td>
<td>101</td>
</tr>
</tbody>
</table>

Knowledge

a. Application

There were significant association found between the place where the staff worked and knowledge on colour coding application for conditions such as:

- age 15 and less (p value 0.001)
- baby weight less than two kilogram or more than four kilogram (p value 0.000)
- unsure of dates (p value 0.004)
- a drug addict mother (p value 0.000)
- mother less than 32 weeks with Haemoglobin eight to nine gram %, (p value 0.024)
- mother more than 32 weeks with Haemoglobin nine to ten gram %, (p value 0.001)
- maternal height less than 145 centimetres (p value 0.000)
- foetal heart rate less than 120 or more than 160 per minute (p value 0.005).

Health staff were able to apply tagging on the above cases better than the Hospital staff.

There were no significant association between their working places and ability to tag these two conditions;

- weight gain more than one kilogram per week in the first trimester (p value 0.529)
- haemoglobin less than eight gram % (p value 0.152)

No significant association was found between training and the total score they obtained in colour coding. (p value 0.332).

Working 10 years or more also doesn’t seem to have any influenced on the total score obtained by the staff (p value 0.51). However the working category whether being a Doctor, Staff Nurses or Midwife had significant association with the total score obtained (p value 0.007, Chi square 9.72). Doctors were found to have lower knowledge on colour coding compared to other categories of staff (Table 4).

Table 4: Relationship between category of work and the total score obtained

<table>
<thead>
<tr>
<th>Category</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctors</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Staff Nurses and Sister</td>
<td>18</td>
<td>61</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>Midwives and Community Nurses</td>
<td>9</td>
<td>57</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>123</td>
<td>156</td>
<td></td>
</tr>
</tbody>
</table>

b. Knowledge in steps in applying antenatal code;

A significant difference was seen between Hospital and Health Staff and their ability to list the essential steps for applying Antenatal coding. 44.0% (37/84) staff was able to list all the four essential steps in colour coding application and 89.2% (33/37) of them were health staff.

Significant association were found between place of work and the ability to list all four essential steps in Colour coding application, (table 5).

Not only that health staff were able to list the essential steps in coding application but they were also able to defined Antenatal coding (p value 0.000), Low Risk (p value 0.020), High Risk (p value 0.000) and gave the three benefits of Risk Approach.
concept required (p value 0.046) better compared to the hospital Staff, (table 5). There were no differences between the different category of works and the ability to defined Antenatal coding (p value 0.784) Low Risk (p value 0.163), High Risk (p value 0.082) and gave the three benefits of Risk Approach concept required (p value 0.571).

Table 5: Ability to list all the essential steps in colour coding, gave the benefit of Risk approach Concept, define Antenatal Coding, High Risk, and Low Risk.

<table>
<thead>
<tr>
<th>Able</th>
<th>Health</th>
<th>Hospital</th>
<th>( \chi^2 )</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(89.2%)</td>
<td>(10.8%)</td>
<td>(100.0%)</td>
<td>5.27</td>
<td>0.022</td>
</tr>
<tr>
<td>(68.1%)</td>
<td>(31.9%)</td>
<td>(100.0%)</td>
<td>3.95</td>
<td>0.046</td>
</tr>
<tr>
<td>(55.0%)</td>
<td>(45.0%)</td>
<td>(100.0%)</td>
<td>21.66</td>
<td>0.000</td>
</tr>
<tr>
<td>(58.8%)</td>
<td>(41.2%)</td>
<td>(100.0%)</td>
<td>5.43</td>
<td>0.020</td>
</tr>
<tr>
<td>(57.1%)</td>
<td>(42.9%)</td>
<td>(100.0%)</td>
<td>16.46</td>
<td>0.000</td>
</tr>
<tr>
<td>(63.8%)</td>
<td>(36.2%)</td>
<td>(100.0%)</td>
<td>16.66</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Discussion

Training

Training was found to be important before a risk assessment tool was used. This was seen in Africa, where aborigines was taught to assess their antenatal mothers using 'at risk antenatal score cards' and in Thailand, where the nurses were trained to screen their cases using a scoring technique at 28 weeks and during admission for delivery.

Similar situation was not seen in this study, because training did not seem to have effect on their knowledge. Place of working and familiarity with the guidelines provided by the Ministry would have help them during their daily practice. This could also be related to the infrequent usage of colour coding, where in hospitals colour tag was rarely applied to the antenatal cards. During the study period only two out of twenty cards were coded as red. Others were either being 'stamped' as high risk, biohazards or problems summary were written on the cards. For effective usage of Antenatal coding Staff should be well versed and should have adequate knowledge on colour coding.

Not all Staff working in Hospital or Health site received training or update information on colour coding during their years of services; 35.1% (27/77) of Hospital and 35.4% (28/79) of Health Staff had no training. Study also showed significant association between training and years of working.

Those working ten years or less, had higher percentage of being trained on the colour coding system compared to those who worked more than ten years due to the incorporation of the colour coding system into their teaching curriculum. However the training did not seem to influenced the Staff in obtaining better total score on the application of colour coding for certain maternal condition. This was supported by the analysis which showed no significant association between trained or not trained with the Total score obtained (p value 0.481). These seem to differ from what was found in earlier studies in Thailand which showed that a trained person could screen the pregnancy at risk and thus predict the outcome better compared to those who had not been trained.

Knowledge

There was significant difference between Hospital and Health Staff on knowledge for certain variable tested. Health Staff was able significantly to list the four essential steps for antenatal coding (p value 0.022); had better knowledge on application of the specific colour code for each of the ten maternal condition questioned; they were able to defined Antenatal coding (p value 0.000), Low Risk (p value 0.020), and gave the three benefits of Risk approach concept required (p value 0.046).
Those working at the Health site had better knowledge than those working in the Hospital. This was expected because those in Hospital had lack of exposure compared to those at health site. Another reason was that there were only 26.0% (20/77) of the Hospital staff who had used colour coding and only 15.6% (12/77) were able to name the Guidelines for management of High Risk cases in pregnancy.

Having adequate knowledge and being familiar with the guidelines provided were important because without it Staff would not be able to practice coding accurately, thus affected their judgement and management.

Not only the inadequate knowledge would also influence Staff attitude, it also cause uncertainties in their practices. The condition worsened when there was inadequate supervision by senior Staff or Supervisor.

**Continuation of practices**

Study showed that colour coding was practised at all Health clinics. However analysis done on Hospital cards showed that only 2.1% (One coded Yellow, two coded Red). Another 119 which should be coded as Yellow and 18 which should be coded as Red but not coded were being 'stamped' as Lower Segment Caesarean Section, High Risk, Biohazards or no labels were applied (for normal cases). This showed that there was no continuation of the coding system from Health site to the Hospital.

This was because Antenatal colour coding was intended more to be used at health centre and community clinics. The intention was to enable Community Midwife or Midwife to differentiate cases, which they could continue to see and those that should be referred directly to the appropriate category of staff at appropriate level without unnecessary delay. Current referral at health clinics doesn't seem to follow the initial guidelines provided. Not all these cases were seen by the appropriate person according to some of the Staff during the study.

Lack of Doctors, Clients who did not follow their appointment date or defaulters thus failed the system to comply with the guidelines which stated that Yellow tag needed to be reviewed and assessed by Medical and Health Officer. Even the Red tagged cases upon discharge from hospital were not seen by the Doctor, due to no permanent Doctor.

**Managerial role**

Supervision is important to ensure coding to be practiced correctly by the Staffs. Analysis showed that 57.14% of the Staff had not received supervision throughout their practices. Lack of supervision could have affected the colour coding application. If adequate supervision was made there would not be any cards left uncoded throughout the pregnancy and there would be no cards with wrong colour code applied.

For us in Malaysia the Colour Coding system was introduced as a managerial tool since 1989. But how familiar are we, with this coding system? Doctors are supposed to monitor whether the colour tag was applied correctly or not. Even at the health centre the Doctors had never tagged their clients, since it was being done by the Nurses. These study showed that there were significant differences in the knowledge between the different category of staff and the total score on colour coding application. 45.5% (5/11) of the Doctors in this study had obtained the total score of six or more. Where else 86.4% (57/66) community midwives and 77.2% (61/79) staff nurses had obtained better in the total score of six or more. These would effect the monitoring done because the supervisor has less knowledge compared to those being monitored.

Other study which was done by Ministry of health in knowledge and skills on management of high risk pregnancy for the different category of staff; Public health Sister was found to have the least knowledge. Therefore for the success of the system the supervisor themselves should have better knowledge.

To ensure Antenatal coding was carried out successfully, managers or supervisors should play their role well. According to 40% of the Staff there was inadequate supply of stickers and check-list in some of their clinics. This occurred at least two to three times per year. Having check-lists attached to the Antenatal Not only the Staff has to rewrite the colour code based on the old check list or used their own money to do Photostats of the check list. They also had to purchased coloured papers, cut into small pieces which were improvised as stickers. These is a waste of time because the staff manpower should be utilised professionally, such as health education or caring for the antenatal mothers.
Conclusions

The colour coding system would be a good managerial tool as it was intended too. However, there were certain limitations found, even at the implementation level.

Training

Even though formal training was found not to have influenced their knowledge, but frequent usage of the system had provided them with the ability to code their antenatal women, these was seen especially among health staff.

Doctors who was supposed to monitor the on-going process of colour coding usage had less knowledge compared to other staffs. This is because there was no training given during medical school. Thus how are they going to monitor others?

Time consumption

It was found in this study that the mean time taken for coding was 16 minutes. The time taken for seeing a patient is only ten minutes, therefore one woman took 26 minutes to be reviewed. The time taken for going through check-list and tagging the cards would be more useful if it is use to see patient or giving them health education. A pregnant women would be happier if more time were spent talking to them. Rapport will be achieved and therefore they are more willing to tell their problems to the staff. Thus, more problem face by the women can be detect in 16 minutes.

Continuation of usage

Even though the colour coding system was mean to be used at health site, however staffs working in hospitals should also have adequate knowledge on it. These is because in hospital admission room these cases were being attended by nurses before they are being reviewed by doctors. Therefore the nurses and other staff should have adequate knowledge on different colour code applied to be aware on the emergency need when it arise.

Recommendation

Training

In this study, staff who worked less than ten years was found to have training compared to those who worked more than ten years. However this study also showed that 41.8% of those who had inadequate training are those who work less than ten years.

It was stated in the curriculum that colour coding were taught during the Midwifery post basic course and Community Midwife training. Currently Community Midwife students had their attachment at the health clinic for only 22 to 25 weeks (total course two year and six month). However the attachment include postnatal care and home nursing. A review in the curriculum would help to improve the situation.

Doctors who need to supervised the staff were found to be less knowledgeable in application of colour coding compared to the midwives and staff nurses. This was because no training were being given regarding the colour coding, in the medical school. Therefore in order for the doctors to act as supervisor the colour coding should be incorporated into the medical school curriculum.

Refresher course

To continue with the usage, a refresher and in-service training on colour coding system should be given especially to Staff who was transferred from hospital to health. This is because study showed those in hospital were not familiar with the application, and the guidelines provided by Ministry of Health.

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Supervision and supply

Supervision by senior staff should be done frequently to ensure the coding system was accurately applied with complete check-list and colour tag. Staff and those at managerial level
should ensure the supply is adequate. Indent should be done early and regularly. Supply should be given more than the previous years number of deliveries.

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