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Colour coded client segmentation (CCCS) public health approach to educate the community to deal with problem of hypertension: A pilot study

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Abstract:

INTRODUCTION: We know that risk communication is equally important as risk identification, which is usually not communicated properly to the patients and resulting in poor outcomes, especially in hypertensive patients.

OBJECTIVE: Our study objective was to evolve and test a colour coded client segmentation based public health approach to educate the community to deal with problem of hypertension.

METHODOLOGY: This cross-sectional pilot study was done in March 2020 among purposively approached in a primary health centre to 100 people aged above 18 years, among them 41 gave written consent for the study and their demographic information was noted. They were given colour coded cards as per the current blood pressure level and previous history of hypertension. On each colour coded card, specific advice was written for that category. For all the participants, blood pressure and treatment seeking behaviour was noted. For hypertensive patients, adherence to medication and non-pharmacological measures was noted.

RESULTS: Mean age of the participants was 46.5 ± 13.06 years. Mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) of the participants were 135 ± 16.85 mm Hg and 86 ± 11.42 mm Hg, respectively. Among the participants, 10 (24.39%) had a known history of hypertension. Among them, as per the blood pressure levels measured on the day of the study 50% (5) had their blood pressure levels under control. Interestingly 16 (39%) participants were found hypertensive incidentally.

DISCUSSION: It is evident from the studies that colour coded approach is used in multiple ways, in multiple settings, for multiple diseases. To our knowledge, little focus has been given for hypertensive disorders in the community level. We merely bother about making their risk profiling, even in the digital age. Sometimes physicians in emergency become puzzled whenever patients collapsed in front of them and we missed the "Golden Hour" for the treatment by searching patients' medical details.

CONCLUSION AND RECOMMENDATIONS: The above problem can be solved by risk profiling of chronic patients by colour coded OPD/Health cards.

Keywords:

Client segmentation, health promotion, hypertension, risk prediction

Introduction

Globally as well as in India, hypertension, the silent killer is leading to an

increasing number of deaths every year. It is a well-known fact that compliance to treatment in chronic diseases like hypertension is poor. This is a major factor

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for development of complications leading to death due to cerebro- or cardio-vascular events in hypertensive patients.

There is a need to find ways to convince such patients to adhere to the prescribed treatment. One such method is to use colour coded segmentation approach. It means providing hypertensive patients with different coloured cards based on the level of prevention and type of care needed. For example, providing green coloured card to non-hypertensive participants whose blood pressure (BP) is normal, yellow coloured cards to non-hypertensive participants with BP at borderline (SBP = 121-139 mm Hg and/or DBP = 81-89 mm Hg), blue coloured cards to previously non-hypertensive participants with first time BP reading of SBP >140 mm Hg/or DBP >90 mm Hg, orange cards to known hypertensive patients and red cards to survivors of hypertension related complications.

Study objective

Against this background, a pilot study was conducted with an objective to evolve and test a colour coded client segmentation based public health approach to educate the community to deal with problem of hypertension.

Methodology

This pilot study was done in March 2020 among purposively approached to 100 people aged above 18 years, among them 41 participants gave written consent for the study. Ethical clearance was taken from Institute Ethical Committee. The study participants were provided with the colour coded cards as per the current blood pressure level and previous history of hypertension. On each colour coded card, specific advice was written for that category. For all the participants, blood pressure and treatment seeking behaviour was noted. For hypertensive patients, adherence to medication and non-pharmacological measures was noted.

The idea was to screen them and find the people with elevated blood pressure levels, and to introduce colour coded client segmentation type of health promotion approach. All the participant was briefed about the study. An interview schedule was administered, and height, weight, BP, and random blood sugar levels were measured.

Interview proforma was self-designed, semi-structured interview schedule with questions related to socio-demographic details, status of hypertension, hypertension related family history, awareness regarding complications and history of complications due to hypertension. Height was measured with SECA stadiometer, weight was measured with electronic

digital weighing scale, BP was measured with Omron digital sphygmomanometer and blood sugar levels with glucometer. All the measurements were taken following standard techniques. All the instruments were calibrated before the study. All the investigators collecting the data were priorly trained in measuring the parameters as per standard techniques. With the help of height and weight measurements body mass index (BMI) was calculated, using the formula $BMI = [\text{weight in kilograms} / (\text{height in meters})^2]$. After calculating, BMI was categorized into underweight, normal, overweight, and obese as per Asian cut-offs.

Participants were given colour coded cards, based on their current blood pressure levels and status of hypertension. There are five types of colour coded cards, viz. Green, Yellow, Blue, Orange and Red. Green indicates normal blood pressure (SBP <130 mm Hg and DBP <85 mm Hg) and not a known hypertensive, yellow indicates at risk, i.e., high-normal blood pressure (SBP = 130 – 139 mm Hg and/or DBP = 85 – 89 mm Hg) and not a known hypertensive, blue indicates blood pressure levels more than the cut-off for hypertension (SBP = >140 mm Hg and/or DBP = >90 mm Hg) and not a known hypertensive, orange indicates status of known hypertension and Red indicates known hypertensive with history of suffering from complications. Cards with pre-written key messages is shown in Figure 1.

Data was entered in MS Excel. After data cleaning, data was exported to STATA 13.0 (Stata Corp., College Station, Texas 77845 USA) and analysis was done. Continuous variables were presented as mean and standard deviation (SD) or median and categorical variables were presented as absolute numbers and percentage.

Results

Mean age of the participants was 46.5 years with standard deviation of 13.06. Mean SBP and DBP of the participants were 135 mm Hg and 86 mm Hg with

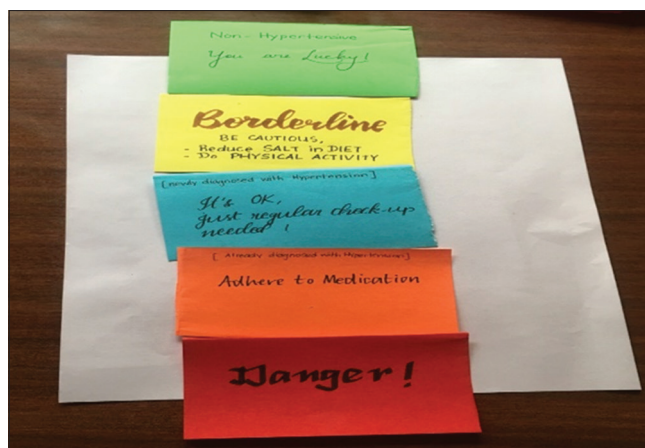


Figure 1: Key messages on colour coded cards

standard deviation of 16.85 and 11.42, respectively. Detailed distribution of the characteristics of the participants is given in Table 1.

Among the participants, 10 had a known history of hypertension. Among them, as per the blood pressure levels measured on the day of the study 50% (5) had their blood pressure levels under control and 50% (5) were suffering from uncontrolled hypertension. There were 16 (39%) participants whose blood pressure levels were more than the office cut-off levels for Hypertension (as per 2020 ISH global practice guidelines) but with no known status of hypertension.

Discussion

Risk profiling through colour coded client segmentation based public health approach is very useful to educate the community to deal with the problem of hypertension and averting deaths due to acute hypertensive disorders. Specific to the health systems, Colour coding is defined as- "A systematic process of displaying information using different colours for providing assistance in classification and identification."^[1] This system of colour coding emerged first in military to differentiate natives from enemies, later on it was used in integrated circuit technology and , navigation and aeronautical sector. In current times, such colour coding system is used in

many diagnostics and therapeutic modalities which have been enlisted in Table 2. Regardless of its use in different sectors, be it military or healthcare system, colour coding system has been advantageous in ensuring better compliance, depiction, high quality, and conventional categorization of health ailments. Ultimately it warrants prevention of fallacy and miscalculations, escalates health promotion and inflate patient safety.^[1,2]

Literature documents that in low income settings, the introduction of colour coding in health systems have enhanced quality health care services by field level workers.^[1] Using this unique system to classify health ailments based on colours, this has served its purpose to right away aid in diagnosing the disease and starting the appropriate treatment without any delay. Such an evolving mechanism has augmented health systems and have managed to improve existing poor health indicators.^[1,2] Moreover, minimizing the human made errors especially in diagnosing and therapeutic modalities have been convincing too for this colour coding system.^[3,4]

It is not such that there are not any examples of colour coding system prevalent in public health. The growth chart recommended by the World Health Organization (WHO) for early identification of malnutrition in under-five children is based on the colour coding system.^[1,4] Such colour coded charts have brought revolution in early identification of nutritional status among children not only by health care professionals but its easy interface and colour codes are recognised by mothers or caretakers irrespective of their educational status and they could easily pronounce future management for the child.^[1,4] Based on the same mechanism, a colour coded tape commonly called as Shakir’s tricoloured tape has been instrumental in screening and identifying children with malnutrition in larger population groups of under five children by just measuring the mid-upper arm circumference with high precision, minimal cost and training requirements.^[5] Introduction of Integrated Management of Neonatal and Childhood Illness program (IMNCI) for the management of childhood illnesses is also based on colour coding system which include categorisation of children into three categories; pink (*i.e.*, they need urgent referral to higher centre); yellow (*i.e.*, they need initiation of treatment at the existing health care setup); and green (*i.e.*, this category patients can be managed in home).^[1,6] The decision for the managements are taken by health care professionals who are provided training to follow SOP based on clinical sign and symptoms of the child.

Another situation where this colour coding has been much useful is Triage.^[1] A method used by rescuers in disaster situations to quickly categorize affected victims based on the “severity of their injuries” and

Table 1: Distribution of participants by various characteristics

Characteristic	Total (n=41) n (%)
Age (in years) [n (%)]	
Mean	46.5±13.06
25-40	14 (34)
41-55	18 (44)
56 & above	9 (21)
Marital status	
Married	32 (78)
Not married	9 (19.5)
Education [n (%)]	
Graduate	13 (32)
Postgraduate	24 (59)
Work in media (in years)	20 (10 - 25)
Work in current position (in years)	10 (4-16)
Hypertensive status	10 (24)
Family history of Hypertension	19 (46)
Awareness of complications	28 (72)
Mean Systolic blood pressure (mm Hg)	135±16.85
Mean Diastolic blood pressure (mm Hg)	86±11.42
Mean Random blood sugar (in mg/dl)	108±5.35
BMI status - Obese	31 (76)
Colour coded cards	
Green	6 (15)
Yellow	9 (22)
Blue	16 (39)
Orange	10 (24)

the “likelihood of their survival” with quick medical/ surgical interventions.^[7]

Yet another practical application of colour coding system has been in use in applying the principles of standard days method.^[8] A thread of four colour coded beads are used as a temporary contraceptive by women having low literacy. It is simple to use, less cost associated with it, can be used without medical supervision, no side effects associated with it and this tool has added to the women empowerment in a more powerful but transparent way.^[8]

Furthermore, the syndromic management of sexually/ reproductive tract infections under National AIDS Control Program (NACP) is also done using colour coding system.^[9] Although the final diagnosis is made by the trained medical officer posted at the primary health centre but this system allows easy distribution of drug based on colour systems to the patients.^[9]

Similarly this colour coded system is existing in the programs like National Tuberculosis Elimination Program (NTEP) and National Leprosy Elimination Programme (NLEP) in India for effective delivery of drugs by the health workers to the patients once a confirmed diagnosis is made by the doctor.^[10] Colour coding systems is also followed in hospitals for the segregation of biomedical wastes as per the BMW 2016 rules.^[1,11] Biomedical waste management is done using four colour coded bags (black, blue, red and yellow) which allows effective segregation and safe disposal of bio-medical waste.^[1,11]

Pretty similar to this, the vaccine vial monitor (VVM) (a heat sensitive strip on the vaccine vials) is also based






on the principles of colour coding.^[12] This colour coding system is now been almost everywhere in our health system since sometime [Table-2]. Assessing the antenatal care effectiveness;^[13] stratification of radiological tests;^[14] colour coded signalling systems in hospitals;^[15] improving multiple infant safety;^[16] colour coded anaesthetic syringes for prevention of drug swapping;^[17] gas cylinders;^[18] colour coded wrist bands for identification of specific alerts like allergies;^[19] periodontal instruments;^[20] asthma inhalers;^[21] drug packaging;^[22] for sensitization sessions on electrocardiograms;^[23] to monitor the use of medicines beyond their expiry date;^[24] radiological scans and other dye-based investigations;^[25] *etc.*, .are examples of prevailing this colour coding system in diverse health settings.

It is quite conspicuous from the above noted facts that the colour coded approach has been in use in our health system since sometime and this system has been useful in managing outcomes in multiple ways. To our knowledge and after through literature review, we found that the disease like cardiovascular disease, which is most common has got a little scope to flourish under such colour coded system. We have scope to categorize the patients based on their risk factors into different colours so that appropriate management is directed towards them whenever needed. Due to the absence of such system, patients are usually lost as most of the initial time (Golden hour) is wasted in enquiring patient details from the attendants. Such setback issues can be solved once risk profiling of chronic hypertensive patients by colour coded OPD/health cards using standard risk prediction charts or simply we can develop colour coding as per our convenience. This can be done in a community-oriented colour coded client segmentation approach based integrated comprehensive care program [Table 3] One step ahead we can write

Table 2: Some existing uses of colour coding in health sector

Programmes/Medical conditions	Use
Malnutrition	Shakir’s colour coded tape
IMNCI	Colour coded Integrated Management of Neonatal and Childhood Illness card
Disaster	Triage using colour code
Bio Medical Waste Management	Colour coded bins
National AIDS Control Program	Colour coded Sexually Transmitted Infections/Reproductive Tract Infections kits
National Tuberculosis Elimination Program	Colour coded anti TB medication box
National Immunization programme	Colour coded Vaccine Vial Monitors
Menstrual health	Colour coded beads

Table 3: Proposed colour coding based comprehensive care program for hypertension control in a community

Colour coding	Interpretation	Recommendations
	Normal blood pressure	Carry out physical activity daily
	Borderline	Reduction in dietary salt and increase in physical activity
	Newly diagnosed	Regular Check-up is needed, lifestyle modification
	Already diagnosed	Strict adherence to the medication; maintain dietary modifications and follow routine exercise/walk
	Complications due to hypertension	Need rehabilitation and routine follow up

interpretations and recommendations/instructions on this colour coded health card in an easy language for better understanding of the patients (Like MCP cards).

Advantages

This simple yet powerful tool has multiple benefits-

1. It will help patient segmentation according to risk profiles (carry in pocket colour coded health card)
2. It will serve as a community triage
3. It will be easy to identify high risk patients in a crowded OPDs...helpful to the patients, doctors, health staffs and most importantly for the bystanders in case of any medical emergency
4. It can serve one's self-control and peer group control by social pressure

Limitations

However, the colour-coded approach has some limitations as an example we have limited colours for coding against abundant pharmacological products available; providers or patients with colour-blindness may not understand regular colour codes; sometimes, the colour coding may be inaccurate; initial cost of making colour coded health cards, training required for health professionals; and connotation of certain colours with specific meaning like red for warning, black or white for death, and therefore it should be used judiciously to avoid confusion.^[18,23,26,27,28] These challenges should be carefully evaluated and addressed through evidence-based interventions in respective contexts minimizing the hazards and maximizing health outcomes.

Conclusion and Recommendation

We conclude that, colour coding system in chronic disease has tremendous potential to ensure health service delivery of good quality, especially in poor-resource settings and where disease burden is high from chronic diseases. Universal implementation of standardized colour-coding approach can benefit patients and healthcare professionals both in a sustainable way.

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Conflicts of interest

There are no conflicts of interest.

References

1. Park K. Preventive medicine in obstetrics, paediatrics and geriatrics. In: Park K, eds. Textbook of preventive and social medicine. 20th ed. Jabalpur: Banarsidas Bhanot; 2009. pp 468-71, 495-6, 698-702.
2. APA. APA statement on the use of colour coding. Washington, DC: American Psychological Association ed.; 2008.
3. Deboer S, Seaver M, Broselow J. Colour coding to reduce errors. *Am J Nurs* 2005;105:68-71.
4. Oettinger MD, Finkle JP, Esserman D, Whitehead L, Spain TK, Pattishall SR, *et al.* Colour-coding improves parental understanding of body mass index charting. *Acad Pediatr* 2009;9:330-8.
5. Chaturvedi M, Nandan D, Gupta SC. Rapid assessment of nutritional status of children in Agra district. *Indian J Prev Soc Med* 2006;37:165-9.
6. WHO. Integrated Management of childhood illness (IMCI). Geneva, Switzerland: World Health Organization; 2013. Available from: http://www.who.int/maternal_child_adolescent/topics/child/imci/en/.
7. Ramesh AC, Kumar S. Triage, monitoring, and treatment of mass casualty events involving chemical, biological, radiological, or nuclear agents. *J Pharm Bioallied Sci* 2010;2:239-47.
8. Family Planning Services. Cycle beads for fertility awareness: A method of natural family planning; 2013. Available from: http://www.familyplanningservices.org/fpswebsitehealthinfotopicsheets/pdf/Natural_Family_Planning.pdf.
9. Government of India. National guideline on prevention, management and control of reproductive tract infections including sexually transmitted infections. Mumbai: Ministry of Health and Family Welfare, Government of India Publ. 2007.
10. TBC India. Managing the RNTCP in your area. A training course (Modules 1-4); 2011. Available from: <http://tbcindia.nic.in/documents.html>.
11. Jindal AK, Gupta A, Grewal VS, Mahen A. Biomedical waste disposal: A systems analysis. *Med J Armed Forces India* 2013;69:351-6.
12. Turner N, Laws A, Roberts L. Assessing the effectiveness of cold chain management for childhood vaccines. *J Prim Health Care* 2011;3:278-82.
13. Ravindran J, Shamsuddin K, Selvaraju S. Did we do it right? An evaluation of the colour coding system for antenatal care in Malaysia. *Med J Malaysia* 2003;58:37-53.
14. Phan TD, Lau KK, De Campo J. Stratification of radiological test ordering: Its usefulness in reducing unnecessary tests with consequential reduction in costs. *Australas Radiol* 2006;50:335-8.
15. Doughman D, Fitzpatrick T. Hospital pre- paredness and the terrorism alert system. *J Healthc Prot Manage* 2003;19:47-54.
16. Salera-Vieira J, Tanner J. Colour coding for multiples: A multidisciplinary initiative to improve the safety of infant multiples. *Nurs Womens Health* 2009;13:83-4.
17. Hyland S. Does colour coded labeling reduce the risk of medication errors? The con side. *Can J Hosp Pharm* 2009;62:155-6.
18. Taylor NJ, Davison M. Inaccurate colour coding of medical gas cylinders. *Anaesthesia* 2009;64:690.
19. Fabbian F, Melandri R, Borsetti G. Colour-coding triage and allergic reactions in an Italian ED. *Am J Emerg Med* 2012;30:826-9.
20. Zohn HK. Colour coding periodontal instruments. *Quintessence Int* 2010;41:591-4.
21. Jayakrishnan B, Al-Rawas OA. Asthma inhalers and colour coding: Universal dots. *Brit J Gen Pract* 2010;60:690-1.
22. van Hamel C, Sant P. Colour-coding of drug packaging. *Anaesthesia* 2013;68:649.
23. Blakeway E, Jabbour RJ, Baksi J, Touquet R. ECGs: Colour-coding for initial training. *Resuscitation* 2012;83:e115-6.
24. Hattoy S, Kozakiewicz J, Seo T. Colour-coding process for monitoring medication beyond-use dates. *Am J Health-Syst Ph* 2010;67:1591.
25. Struffert T, Deuerling-Zheng Y, Engelhorn T, Kloska S, Gölitz P, Bozzato A, *et al.* Monitoring of balloon test occlusion of the internal carotid artery by parametric colour coding and perfusion imaging within the angio suite: First results. *Clin Neuroradiol* 2013;23:285-92.
26. Webster CS, Merry AF. Colour coding, drug administration error and the systems approach to safety. *Eur J Anaesth* 2007;24:385-6.
27. Fong JS. Colour coding complications. *Hosp Health Network* 2007;81:8.
28. Bhattacharya S, Bera OP, Singh DK, Hossain MM, Tripathi S, Boora S, Singh A. Colour coding-based client segmentation approach: A neglected yet powerful tool to tackle non communicable diseases in high burden and low resource setting countries- A primary care approach. *J Family Med Prim Care* 2020;9:5846-9.