CAPSMART- Capacity building of front line health workers by smartphone enabled training based on community derived decision markers for primary prevention and health promotion of non-communicable diseases

Raghupathy Anchala, Anil Parakkad; Sreejesh Nair

***Abstract*— In resource constrained settings, the decision makers in a health system, i.e. health policy planners attempt to distribute the available funds on a priority basis. This leads to a skewed view point since the beneficiaries, i.e. community tries to maximize the aggregated total health benefit conferred. Capsmart project aims to introduce a composite user developed community 'decision' marker which takes into account all the perspectives of relevant stakeholders in a healthcare system. The derived perspectives, based on participatory research and a sound scientific methodology, will inform health policy, and provide an alternative tool to analyze the cost effectiveness of health policies, and prioritize the resource allocation to national health programs. The developed composite decision marker will be custom built, validated and developed as a smartphone application for training and building public health capacity of the frontline health workers on health promotion and primary prevention of non-communicable diseases. Pilot testing the applicability, feasibility and sustainability of a smartphone based training package will enable future decisions to be taken on applicability of the mobile computing and health care technology in developing countries, more so in resource constrained low and middle income countries.**

Index Terms*— *capacity building; decision making; educational technology; fuzzy logic; mobile communication; mobile computing; prevention ; public health care.

I. Introduction

Capacity Building has been determined to a large extent on the health policy decisions in a country or a state, which are run singularly by the policy analysts. To bring in the perspectives of all stakeholders who look at cost benefit and utility (health economists, health policy analysts, subjects suffering from diseases or illness, physicians, sociologists, community key informants form the key elements of a community), a composite user defined community 'decision' marker which takes into account all the perspectives of (vested also) those in the health system is being proposed. Perception is an unique but a significant determinant of the efficiency or acceptability of a system. To arrive at a wholesome parameter that can aid the decision makers to decide on the cost effective interventions, the system must take into account all the perspectives (community included) from each of the involved stakeholders.

In order to overcome the attribute, characteristic level, choice of the scenarios, preferential weights and discrete choices, all of which largely influence quality adjusted life years (QALYs) measurement. A new and a wholesome parameter which does not depend on the methods by which the health state scenarios were constructed and presented to change the perception perceived by the respondents, and which has no bias in the valuation of health-related quality of life associated with the intervention is being proposed in this study. This proposal aims to introduce a composite user developed community 'decision' marker which takes into account all the perspectives of relevant stakeholders in the health system. In resource constrained settings, the decision maker, i.e the community tries to maximize the aggregated total health benefit conferred.

Objectives

(1) Capacity building of Front line health workers using the tools in a Community Based Participatory Research (CBPR) model by developing a community derived comprehensive 'decision' marker for developing, implementing and evaluating a preventive and promotive health care model for primary prevention of NCDs. (2) To build operate and transfer the pilot tested and evaluated health technology model (mobile support system) for primary prevention of non-communicable diseases (NCDs). (3) To pilot test the applicability, feasibility and sustainability of a smartphone based training package.

II. METHODS

'Fuzzy Cognitive Mapping' (FCM) [3-9] is a combination of fuzzy logic and cognitive mapping. It is a technique that takes into account the logic and the strength of direction of each concept (which will be laid down by the participating interviewee, as described below). This will be used to explain the influential role of each concept (synergism or antagonism or interaction which may be mutually exclusive or inclusive) on the measured final outcome. This graphical representation

Manuscript received on May 18, 2012. CAPSMART- Capacity building of front line health workers utilizing community derived 'composite decision markers' for training in primary prevention and health promotion of non-communicable diseases (NCDs) – a build, operate and transfer (BOT) smartphone based mobile support training System. Raghupathy Anchala R.A (corresponding author) is with Pubic Health Foundation of India (PHFI), IIPHH, India. Phone number: 00919618010188; (e-mail:docraghu8@gmail.com). AP is with Data Template, Bangalore, India (email: anilparakkad@datatemplate.com). SN is with Data Template, Bangalore, India (email: sreejesh@datatemplate.com).

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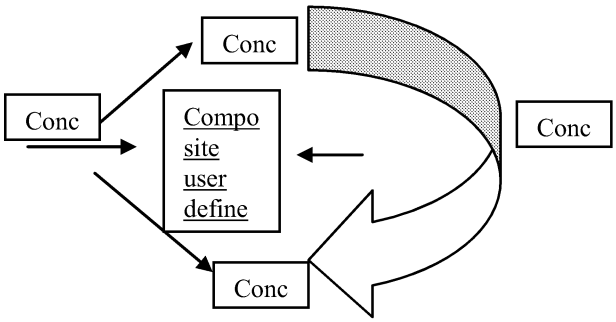
of the knowledge about or the perception of a given system is derived from FCM and consists of factors (concepts or nodes) which represent the perceived important elements of the mapped system. The directed lines labeled with fuzzy values show the strength of the causal conditions between the factors.

In the proposed FCM study, all the stakeholders (community) are directed to assign a value between zero and one (subjective) and draw a link with negative and positive scores (to show directions with probabilities between zero to one). This brings in a community perspective, which will then be coded and analyzed using an open based FC Mapper and Pajek softwares (open source software to analyze the data obtained by the FCM process, developed by Slovenia and German programming developers). The end result is a composite 'decision marker' which is more holistic than QALY, because it takes into cognizance the perspectives of the community and a balanced combined logic of all stakeholders.

Health economists, health policy makers and analysts, key opinion leaders in a community, health care providers and subjects suffering from cardiovascular diseases, patient support groups will form the groups that shall undertake the FCM process (Figure 1). Representative sampling with a Probability Proportional to Sampling (PPS) will yield the appropriate sample size for each separate group. Each member of the group will come up with a FCM containing the key concepts, links and interactions which they perceive to be the most important drivers and constraints for the given problem (health policies for prevention of cardiovascular diseases). A weighted group score from all the stakeholders in the group will be calculated using the dynamics of vector so derived.

Fig (1): Mapping of all the key stakeholders in a community

Fig 2: Framework of a FCM (hypothetical illustration):



Components of a FCM:

1. Free listing of all concepts – Fuzzy
2. Assign values for each concepts and link them - Cognition
3. Visualize - Give directions of effect (placing a positive and negative probability of the value of the strength of association between two concepts or association between concepts and the user defined composite marker.
4. Assign a score of zero to one values – Mapping

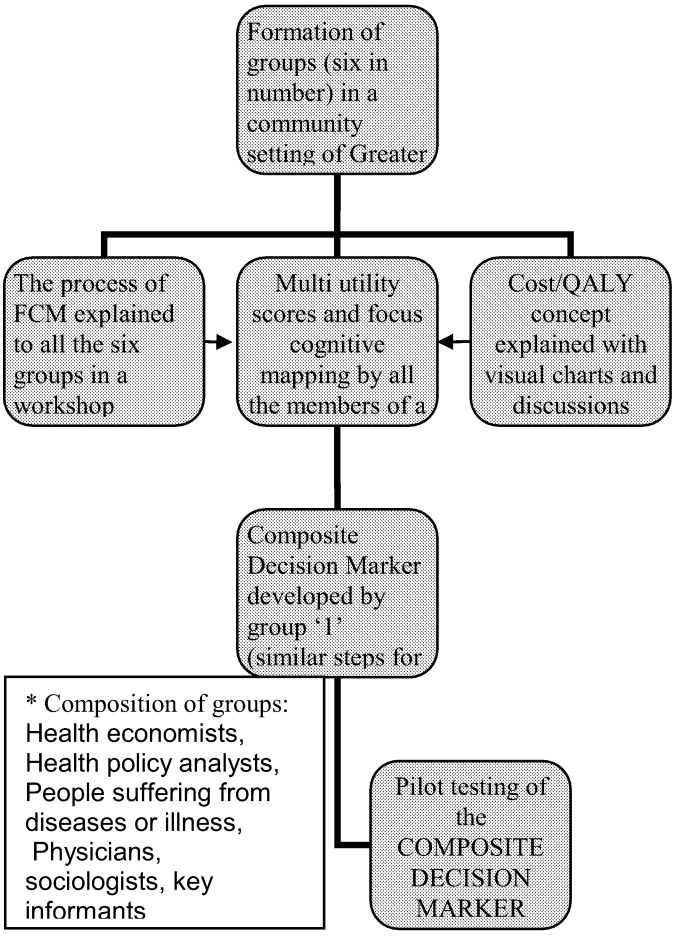
All stakeholders will weigh in their choice which can be cumulated on a weighted scale based on logic and analysis. In conclusion, based on scores assigned for all the key concepts and nodes, a composite response can be generated which decides the influential and widely accepted user defined - decision markers for incorporation into the training manuals

for capacity building initiatives - health intervention, i.e. primary preventive and health promotion strategies for prevention of NCDs

Expected deliverables and time frames:

1. 'Composite decision markers' based on CBPR, PRA, FGDs, key informant interviews for what needs to be incorporated into the training manuals for frontline health workers – 3 months from the study beginning time.
2. Development of a sustainable smart phone platform technology for implementation of locally relevant training materials – 6 months from the study beginning time.
3. Validated tool for analysis of capacity building efforts (during any phase of a policy life cycle - formulation, implementation and evaluation) – 9 months from the study beginning time.
4. Evaluate and mainstream an innovative open source methodology (smart phone platform technology) for training of frontline workers – 12 months from the study beginning time.

Figure 3 - Flow chart for objective one



In conclusion, a group of trans-disciplinary experts, who operate, monitor, supervise and know the primary health system behavior and subjects with cardiovascular conditions would be used to construct the FCM model. Understanding the perceptions and the logic behind choosing and weighing which elements of the systems influence other elements, the experts, (based on their experience, assign the main factors that describe the behavior of the system), shall aim to determine the negative or positive effect of one concept on the others, with a fuzzy degree of causation.

Statistical Analysis Plan: Guidelines for preparing submissions to the Pharmaceutical Benefits Advisory Committee (Version 4.0) [7] November 2006 will be adhered to in data collection and analysis. The collected data variables would be analyzed based on the responses from the scenarios using regression techniques. A multinomial logit analysis would be used because the dependent variable is a discrete random variable. The extent to which the model explains the variation in preference selection and the impact of possible confounding factors will be specifically looked for and reported. A conjoint analysis considering non-health elements (results would be presented with and without including those elements).

The minimal cost of the sampling and error precision would be used to calculate the sample size of each group with adequate power to ensure that the sample size is large enough to measure population variance. The power of the study would be tested and between-group correlations demonstrated. The results as the point estimate of the mean utility of each health state scenario with its 95% confidence interval would be reported. An overall assessment of the approach adopted to elicit preference weights from the hypothetical scenarios will be provided.

III. DISCUSSION

The burden of non-communicable diseases and especially cardiovascular diseases, which has been chosen as an example for application in this proposal, is a huge public health problem in India, accounting for 1/3 of the DALYs lost. We believe the concept has relevance and applicability in the national interest because of these factors: The proposal weaves in community participation, the logic of mapping and the ease of data analysis, and makes this idea easily applicable not only to cardiovascular diseases, but to almost any clinical area plaguing the health system in India. It will also enable decision making in terms of resource allocation, (which is the primary intended outcome for all health economic evaluations) based on direct feedback and participation of the community members.

QALY, with its inherent deficiencies may be unsuitable for use for each and every cost effective analysis health interventions in India. This proposal spanning 12 month time frame, will apply a Community Based Participatory Research (CBPR),

using the feedback from the concerned stakeholders. Currently, there is an insufficient coordination between clinical and economic evaluation of health interventions. Our organization from which this team is drawn consists of Physicians, public health specialists including a health economist, a health policy practitioner, a social scientist, a health systems and health financing expert, and a biostatistician, and has the expertise to conduct and analyze data gained from the proposed translational research which involves both the clinical and economic domains.

Key strengths of the proposal

Focus Group Discussions (FGDs) and (Participatory Rural Appraisal) PRA among all stakeholders to find out the solutions for effective and sustainable IEC sessions for NCD primary and secondary prevention are being attempted to be presented in a novel way. The key feature in this study would be mapping of the 'ideas' and 'plans' by the stakeholders (even vested ones), which ensures a community ownership. Representative cluster sampling will be blinded to the investigator owing to the inherent heterogeneity among rural and tribal settings. Two best and two worst performing districts from a Empowered Action Group (EAG) state – Andhra Pradesh and non-EAG state – Orissa from India will form the samples for the study. Representation presented in their native tongue (pictograms and lay man's perspective) are developed as training materials. Development of smartphone based training modules on prevention of NCDs for frontline health workers will result in paradigm shift in training and adopting technology and healthcare in developing countries. Better utilisation of existing capital, infrastructure and *real time* data capture would occur on adopting this novel CAPSMART technology. A pre and post implementation study to study the effectiveness, acceptability, feasibility, implementation, monitoring & evaluation and sustainability will,be tested out in well-defined outcomes.

Limitations such as (1) whether the FCM method by which the health state scenarios were constructed to allow all the critical changes in quality of life associated with the intervention can be captured and presented in such a way that they are accurately perceived by the respondents; (2) whether the methods (FCM) by which the health state scenarios were derived and constructed can lead to bias in the valuation of health-related quality of life will be mentioned upfront.

IV. CONCLUSION

The derived composite decision maker which combines participatory research and a sound scientific methodology, will inform health policy, and provide an alternative tool to analyze the cost effectiveness of health policies, and prioritize the resource allocation to national health programs. The developed composite decision marker will be validated and mainstreamed in future studies so as to measure the utility of primary prevention of cardiovascular diseases in resource constrained settings. The proposal weaves in community participation, the logic of mapping and the ease of data analysis, and makes this idea easily applicable not only to cardiovascular diseases, but to almost any clinical area plaguing the health system in India. It will also enable decision making in terms of resource allocation, (which is the primary intended outcome for all health economic evaluations) based on direct feedback and participation of the community members.

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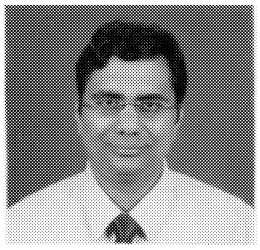

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(1). Are tuberculosis patients in a tertiary care hospital in hyderabad, India being managed according to national guidelines? Kondapaka KK, Prasad SV, Satyanarayana S, Kandi S, Zachariah R, Harries AD, Nagaraja SB, Tetali S, Anchala R, Kannuri NK, Murthy K, Koppu D, Vangari L, Rao S. PLoS One. 2012;7(1):e30281. Epub 2012 Jan 17.

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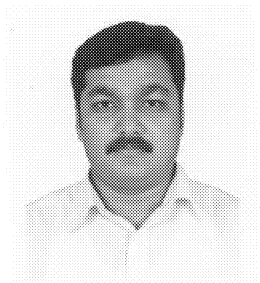

Brief profile:

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- Currently working as Chief Executive Officer for Data Template, having experience in software development on various platforms & verticals.
- Having experience in domains- e-governance, Embedded systems, Finance, Mortgage, Healthcare, ERP (SAP and MS Navision), e Learning, Retail etc.
- Experience in leading, guiding and mentoring team for various projects.
- Executed & managed various projects for major companies like First American Core Logic , CoreObjects (Currently Symphony Services) etc.
- Master of Computer Applications from University of Madras.

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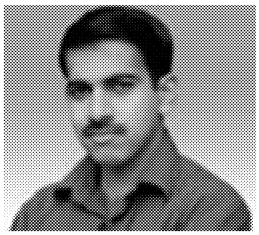

Brief Profile:

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