Introduction

The construction of graphical clinical guidelines affords unique opportunities for education and the portrayal of critical steps in decision making. While also a collection of words on the page, these graphically sequentially linked decision nodes serve to transform information in several fundamental ways. The construction, revision and application of these graphical guidelines – MAPs (Multiphasic Algorithmic Protocols) – provides many opportunities for teacher and learner, as well as clinician and patient, as they seek to define a ‘standard of care’ in an understandable, logical and sequential manner.

Once generated and displayed in a paper-based format, the application to a point-and-click ‘if-then’ logic presents itself in an easily transformable manner on to a computer web-based application. In this paper, we hope to introduce the reader to the processes involved in constructing and revising MAPs. We will present the results of a four-year application of MAPs using registered respiratory therapists (RRTs) for management of asthma. Finally, we will discuss web-based application possibilities and possible integration into Electronic Health Records (EHRs).

Rationale for MAP building

One might ask ‘Why construct such clinical graphic guidelines and choose the title MAPs?’. One could further ask ‘Why are such graphic guidelines different from text-based guidelines and what benefits do such tools allow?’. The simplest answer is that in the construction of sequentially based protocols lies not only the fundamentals of medical decision making but also the application of structured programming and a reflection of the real world. Within any clinical decision lie the seeds of a MAP. Ultimately, some threshold criteria must be met for the clinician to proceed with the next phase of either work-up or treatment. By sequestering decisions into sequentially linked nodes, we present clearly defined structural criteria. The resulting depiction of standardised decisions is explicit. Knowledge and the depiction of clear criteria help order an approach to knowledge that can be discussed and debated in a meaningful way using the MAP. Clinician training is in fact a refining of internal patterns. Making the process explicit allows it to be shared.

MAP construction

In the initial phases of a MAP construction process, consensus opinion, expert opinion, and supporting articles and trials that are applicable to a particular topic are assembled. Such a consensus process has been used by many expert panels. The difference with MAP construction is the use of graphics to highlight ‘if-then’ links in knowledge. While some see the depiction of knowledge in this format as threatening and perhaps supplanting the clinician, we see it rather as supplementing and augmenting, as well as making explicit, clinical decisions. As an individual practitioner or group struggles to expose decision making, the inherent biases, gaps in knowledge and vague areas become clearer.

Such construction methods have been invaluable in promoting discussions not only in the classroom setting but also in implementing discussion among experienced clinicians as an evolving MAP is presented for critiques. The same physician who readily cites prestigious journals may become taciturn and reticent when confronted with a ‘clinical practice guideline’. Once involved in the process, the inherent strengths and applications of evidence-based medicine,
as well as reflections and ramifications of depicting knowledge in such a way, expose themselves. They often leave underlying texts and articles wanting for lack of clarification. In the construction of MAPs, we have also found the promotion of a teacher/learner alliance. MAPs become tools on which to focus and make explicit clinical disease management tools.

### Application of asthma MAPper

While the actual stimulation found in MAP construction has many applications in the teaching and educational arena, we sought to further explore the strengths and uses of MAPs by applying them in tandem with mid-level providers for chronic disease state management. We chose asthma because of its relative simplicity, its tremendous prevalence and its huge economic impact.

In a programme that has grown over four years to now encompass 12 RRTs and support staff with over 10,000 patient visits, we have sought the application of MAPs in conjunction with mid-level providers to impact patient care. In a structured ‘Train the Trainer’ programme, RRTs are given and interact with a series of related MAPs on the clinical staging, classification and treatment of asthma.

After meeting and setting up specific competencies and working under our direct tutelage for three months, the RRTs are made available to primary care providers (family practitioners, internists, paediatricians) in the primary care setting. Using a formalised and relatively structured interview over the course of the initial 60 to 90 minute interview, patients are reassessed, staged and classified for their asthma. Modifications with specific treatment suggestions are then made to the primary care provider.

The programme has been well accepted by providers with growing interest in the MAPs themselves as providers began seeing dramatic decreases in hospitalisations, emergency room visits and unintended visits to their clinics. In studies to date (paper in preparation) the reduction in unplanned primary care provider visits has been 71% (total events 8842, \( P = < 0.01 \)). Asthma-related emergency room visits have dropped 50% (total events 545, \( P = < 0.01 \)) and hospitalisations have decreased 63% (total events = 206, \( P = < 0.05 \)).

In addition to tracking morbidity factors for patients, we have also been tracking inhaled steroid use – a mainstay of asthma treatment. The comparison between ten physicians who were utilising the asthma MAPper programme when contrasted with ten control physicians was dramatic. In co-operation with pharmaceutical companies, we tracked the amount of detailing done to each of these two groups and it was found to be nearly identical. In contrast to this, the use of inhaled steroids for the control group went from 4% to 6% while the asthma MAPper intervention group went from 4% to 17%, nearly a three-fold increase. This is in contrast to national attempts and national figures that are more reflective of the former group. Despite numerous and diverse national attempts at ‘educating physicians’ on the use of inhaled steroids, there has been nowhere near the increase of inhaled steroids that would seem to be needed to control the disease.

### Computer application

Once assembled and revised sufficiently, particularly after application and verification in clinical scenarios, the MAP may be considered for depiction on computer and integrated with existing technology. We have developed software that can assist with not only tracking the patient’s clinical course, but also generating a note suitable for inclusion in the electronic or paper health record. We previously reported (AMIA National Proceedings 1999 – Asthma MAPper) using open source technology that facilitates a point-and-click interaction with a web-based program to generate XML data suitable for inclusion in either the EHR or a database.

The depiction of information in this format also lends itself to a wider scale of dissemination. We are currently working to include it in our evolving open source EHR (TkFP). While currently such a system has limited use, it remains an intriguing idea to scan different EHRs, and promotes the creation of a standardised database reflecting national/international guidelines and promoting optimised patient care that allies the patient directly with the physician with applications within any ‘health maintenance environment’. The [www.medmapper.com](http://www.medmapper.com) site is an online example where people can see the decision making (and construction tools for the MAPs) in real life.

### Summary/conclusion

While this material spans a tremendous breadth and reflects the compilation of numerous concepts presented in various formats (Society for Teachers of Family Medicine, American Academy of Family Practice, American Medical Informatics Association, traditional medical journals) we hope that the reader has some visual grasp of what is involved in a graphic MAP. In thinking for example of a geographic map, one can draw parallels. Text-based directions to get
the reader from one place to another may be very valuable if a defined linear path is followed. But when presented with a graphic pictorial representation of a map, the reader suddenly may find themselves much more cognisant of not only the surrounding area, possible points of interest (parks, rivers, museums), but also encompassing of a more global picture, better understanding of the material, and in particular the ability to navigate alternative routes while maintaining a larger perspective.

We have come from the process of MAP construction which promotes teacher/learner alliance, into MAP application in the asthma education and management programme with resulting positive outcomes and commented on the application of MAPs to EHRs, population-based education and the possible integration and inclusion in larger standards and open source development platforms. Some will naturally find material presented in this format is alien. Still others find it threatening, particularly if seen as a possible vehicle to supplant clinician decision making. Rather, we would propose it as a supplement to physician decision making, a tool to assist mid-level providers, and ultimately the depiction of information that could bring patient, mid-level and provider into a common understanding that promotes and benefits patients, communities and populations as a whole.

ACKNOWLEDGEMENT

This paper was delivered at the PHCSG Annual Conference at Downing College, Cambridge, in September 2001.

ADDRESS FOR CORRESPONDENCE

Dr David Pepper
UCSF-Fresno
c/o University Medical Center
445 South Cedar Avenue
Fresno
California 93702
USA
Tel: +1 559-459-5705
Fax: +1 559-459-4443
Email: drpepper@ucsfresno.edu

Accepted June 2001