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Perspective

## A visual grid to digitally record an Ayurvedic *Prakriti* assessment; a first step toward integrated electronic health records



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### 1. Introduction

In recent years, factors including globalization and economic growth in India and Sri Lanka have driven an important modernization of Ayurvedic Medicine, characterized by increases in evidence-based research and initiatives to standardize remedies and procedures.<sup>1</sup> Ramakrishna et al<sup>2</sup> provide an important example of this trend with the standardization and validation of a questionnaire for the assessment of *Prakriti*. *Prakriti* represents an

individual's unique personality, constitution or connection with the universe and is described on three dimensions or *Dhosa*; *Kapha*, *Vata* and *Pitta*.<sup>3</sup> Ayurvedic clinicians assess a patient's *Dhosa* profile in order to customize diagnoses and customize treatments. Conventionally, a *Dhosa* profile is described using linguistic phrases such as *Kapha-Vata*, or *Pitta-Vata Prakriti*.

Ayurvedic clinicians typically record a patient's *Prakriti* along with the record of consultation in paper based files that are not normally exchanged or made accessible to other clinicians. Increased use, and interoperability with electronic health records, of digital Ayurvedic patient management systems is required. An electronic health record (EHR) is a longitudinal electronic record of patient health information of every event or encounter in a healthcare delivery environment. Smith and Kalra<sup>4</sup> demonstrated that EHRs, when applying international standards, can be used to capture complementary and alternative medicine practice. Sud and Sud<sup>5</sup> claim that patient management systems that digitally record clinical data are an important component for the modernization of Ayurveda and its interaction with Western medicine.

The benefits inherent in the establishment of digital Ayurvedic records, particularly for developing countries, has been identified.<sup>6,7</sup> However, authors also identified considerable obstacles including cost and professional change required for adoption: clinical patient management systems are very expensive and nationally linked electronic medical records represent integration projects that have cost more than \$AUD1 billion in Australia.<sup>8</sup> In a historical view of adoption of information technology (IT) within the United States of America medical sector, Berber, Detmer and Simborg<sup>9</sup> cited the profession's reluctance to embrace new systems, a lack of government policies to encourage change and cost, to be significant factors in delaying transitions to digital healthcare. Venkatraman and Stranieri<sup>10</sup> and Goldstein<sup>11</sup> have noted that other challenges exist for widespread use of information systems in Ayurvedic medicine. These include the need to develop terminological

Abbreviations: App, Application; EHR, electronic health record; HL7, Health Level 7; IT, information technology.

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standards for Ayurvedic concepts and the need to identify ways in which existing inter-operability standards, such as Health Level 7 (HL-7), can accommodate Ayurvedic concepts.

Experiences that delayed the adoption of EHR and information systems in allopathic medicine in economically advanced nations in recent decades can be analyzed to inform IT architectures for Ayurvedic medicine. Chapman<sup>6</sup> lists recommendations for the design of eHealth technologies: the technology should be simple, it should be locally developed, built on existing technology already being used, end users should participate in the design and introduction of new technology and utilize resilient development strategies.

In the next section of this article, a user interface is presented that is designed for use on mobile devices by clinicians and patients. The interface enables the clinician to enter a patient's *Dhosa* in a finer grained manner than the linguistic terms currently used in practice, with a single touch/click of the mobile screen. The claim advanced in this article is that fully integrated EHRs that accommodate Ayurvedic medicine is possible without the expenditure of enormous resources if the architecture evolves somewhat organically driven by end user demand. A mobile device application (App) that enables an Ayurvedic clinician to enter and share a patient's *Dhosa* can act as the trigger for the organic evolution of an EHR and meets many of the recommendations advanced by Chapman.<sup>6</sup>

The model for the transition to digital Ayurvedic records draws on Chapman's dictum that an IT architecture should build on technology being used by having its foundational software execute on mobile devices. Vatsalan et al<sup>12</sup> have described the central role mobile health has to play in leap frogging developing nation healthcare into the 21st century. According to data from The World Bank, the use of mobile phones in India, where Ayurveda is widely used, is among the highest in the world.<sup>13</sup>

Thyvalikakath et al<sup>14</sup> draw on historical analyses in Western medicine to conclude that unless clinical systems are designed to be as intuitively useable as possible, clinician use will remain a barrier. Consequently, the interface for an Ayurvedic consultation tailored to be useable by clinicians and patients, is required to facilitate the entry of data from a patient consultation into a digital repository in as quick and easy a manner as possible. The design of a user interface for an Ayurvedic clinician to enter a patient's *Dhosa* in an easy and seamless a manner can be seen to be a critical success factor for the adoption of information systems in Ayurvedic medicine because the *Dhosa* assessment is an important element of every consultation.

In the next section, an interface for a one click entry of a *Dhosa* assessment by Ayurvedic clinicians is presented.

### 2. Representing TriDhosa on screen

Fig. 1, illustrates a plausible representation that includes a separate sliding data input for each of the *Kapha*, *Vata* and *Pitta* dimensions. This is cumbersome and deviates from core

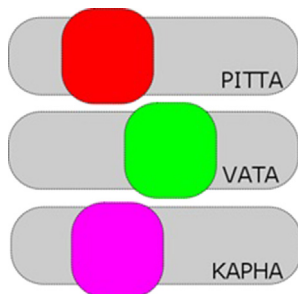


Fig. 1. Three slider representation of TriDhosa.

human–computer design principles elucidated by Johnson.<sup>15</sup> An interface comprising three scales is minimally visual whereas a great deal of human cognition is visually driven. The three scales require the tedious entry of three pieces of data. Further, there is no correspondence between the relationship of *Kapha*, *Vata* and *Pitta* on screen to provide the clinician with a mental model.

Following exploration of the functionality required, it is proposed that a Maxwell Triangle, following the seminal work by Maxwell,<sup>16</sup> can be used for the interface graphic. Fig. 2, depicts a triangle comprised of smaller colored triangles. The vertices represent *Kapha*, *Vata* and *Pitta* and are colored red, blue and green. The center of the triangle is colored white and represents a perfect balancing of the three *Dhosas*. The positioning of the three *Dhosas* on opposite vertices is consistent with the conceptualization of *Prakriti* in mainstream Ayurvedic medicine as described by Ref. 3. The triangle can readily be generated on any device using a conventional HTML 5.0 browser that implements the Maxwell equations, as described by Judd.<sup>17</sup> A clinician enters the *TriDhosa* with a single finger press or mouse click.

The *Vata*, *Kapha* and *Pita* assessment is stored in a database on the clinician's device and can be readily transmitted to the patient's smartphone running the same application, or a Cloud based repository. This represents the first, albeit crude step that can evolve into an IT architecture for Ayurveda.

### 3. An IT architecture for Ayurveda

The model for the transition of Ayurvedic medicine to digitization and EHRs is based on the organic transitioning through four

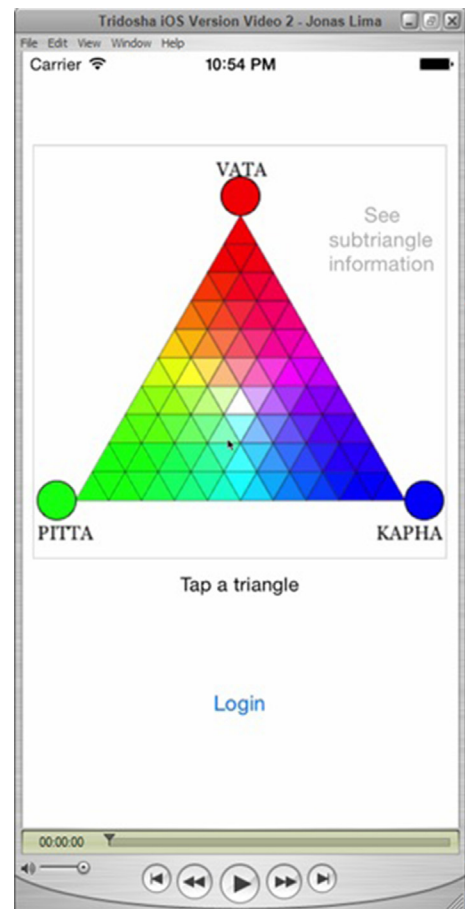


Fig. 2. Vata, Kapha, Pita Grid.

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