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Personalized medicine and informatics

The last numbers of years have produced innovative changes in health care delivery and some changes in health care information systems. If collaborative care and shared decision-making between patients and health care providers is to become a reality, then we must harness the power of information technology to improve clinical care, increase patient satisfaction and reduce health care costs. This would also help to reduce medication errors (1). Personalized medicine refers to the application of cost-effective and individualized strategies for diagnosing, monitoring and treating diseases (2). It is not a pledge of the future; it is becoming the current state in diagnostics and therapeutics. Innovations based on genetic and molecular designs offer patients better care at lower cost because conditions are predicted sooner, diagnosed more accurately and treated more effectively (3).

Questions that need to be answered involve the impact of consumer health informatics (CHI) among users on health care process outcomes; intermediate health outcomes, such as health knowledge and health behaviours; relationship-centred outcomes, such as shared decision-making; and clinical and economic outcomes. Self-management of disease, knowledge attainment and change in health behaviours can be exercised with diet and obesity, addictive behaviours, asthma, diabetes oral health care and other conditions.

In a practical sense, electronic tools and technology applications for consumers and patients can help improve health care processes, such as adherence to medication use and home care recommendations and clinical outcomes, like smoking cessation (4). An analysis conducted by the Bloomberg School's Evidence-based Practice Center for the Agency for Healthcare Research and Quality (AHRQ) was based on an examination of 146 published research studies of patient-focused electronic tools (4). This innovative area of investigation shows the potential importance of CHI.

Consumer health informatics applications are defined as any electronic tool, technology or electronic application intended to interact directly with consumers, with or without the presence of a health care professional. These tools provide or use individualized information to help a patient better manage his or her health or health care (5). Personalized informatics tools can include applications such as telemedicine, online health calculators, interactive computer programs to aid decision-making, SMS text and email messages. These support systems can be applied to a variety of clinical conditions, including cancer, smoking, diabetes mellitus, physical activity and mental health disorders. They have the ability to enhance the breadth and depth of health and wellness management tools, making them more personalized and useful to patients. The iPhone, for example, has applications such as weight tracker, quitter (for smokers), calorie check, food IQ, absolute fitness and others. Why not an application to remind someone to brush, floss, use fluoride or other remineralizing agents or any number of self-care recommendations?

Consumer electronics is changing the way we live, communicate, listen to music, shop and a battery of other activities. It is no surprise that these types of tools could affect health behaviours and delivery of health care. In our quest for evidence-based, patient-centred health care, these tools could make health care available when needed and not only when a medical, dental or dental hygiene office or clinic is open. They may also assist in decreasing health disparities by increasing patient access to health-improving treatments and interventions among the poor and uninsured.

A report was prepared by the the Johns Hopkins University Evidence-based Practice Center. As this new report shows, despite study heterogeneity, quality variability and some data scarcity, the available literature suggests that select CHI applications may effectively engage consumers, enhance traditional clinical interventions and improve both intermediate and clinical health outcomes (4) that provides or uses individualized (personal) information and provides the consumer as well, with individualized assistance, they may help the patient better manage their health or health care (6). Generally, the investigation found no evidence that CHI injured consumers. As well, there was inadequate evidence to determine if CHI provided any economic or cost benefit (4).

The results of the review recommend that several important health-related questions remain regarding the potential utility of CHI applications. Thus far, most CHI applications that have been evaluated focus on one or more domains of chronic

disease management. While this is needed, insufficient attention has been given to the role of CHI applications in the acute exacerbation of combined symptoms of a disease or other urgent and evolving problems that may occur in home and community-based settings. The role of CHI applications in primary, secondary and tertiary prevention needs to be explored in detail. As well, sociocultural factors are increasingly important determinants of health care outcomes. The potential impact on social factors including social isolation and social support and broader social determinants of health need to be evaluated in helping patients address select health concerns in the home and community-based settings (4).

While this report did not specifically address oral care behaviours, it did address behaviours and conditions that could affect oral health such as diabetes, obesity, alcohol abuse and tobacco use. It evaluated the impact of CHI applications on various aspects of relationship-centred outcomes, social support, quality of life, health information competence, decision confidence, improved decision-making skill, reduced social isolation, level of positive interaction with the provider and satisfaction with care. Across these studies, the body of the scientific evidence indicated that most CHI applications evaluated to date had ambivalent effects on relationship-centred health outcomes. More research into this area may help to improve the effectiveness of interventions currently delivered by humans, versus technology (4).

Personalized health care in the realm of oral health care is very new. The moniker 'Personalized Dentistry' is often used as a marketing tool by dentists. However, as our risk assessment knowledge is implemented, such as with caries management by risk assessment (CAMBRA), treatment will become more evidence-based and individual patients will be treated according to their personal oral and social environment, rather than treating all patients in the same way. We will employ the science of pharmacogenomics, when drug treatment becomes personalized medicine and offer personalized medicine treatments based on a person's genetic profile. We are seeing this in oral health care with companies like OralDNA labs. They help dentists and dental hygienists better understand molecular tests (DNA-PCR) that will allow us to diagnose periodontal infections and design tailored treatment plans for each patient. The OralDNA tests offer detection of pathogenic species and the determination of bacterial load, as well as determination of genetic susceptibility traits: mutations or polymorphisms (SNPs) (7). The use of chair side tests in oral health care will assist the clinician with recommendations for the use of fluorides and other remineralizing agents, antimicrobials such as chlorhexidine and essential oils and devices such as power toothbrushes.

The future holds much promise as we continue to learn about and employ evidence-based care, personalized medicine and informatics technologies to assist our patients and the clinicians that serve them.

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Maria Perno Goldie
President Elect, IFDH
Seminars for Women's Health
E-mail: mgoldie@sbcglobal.net