Wellpad ©: An Inclusively Designed Tablet-based Digital Medical Record with Optimized Efficiency and Usability

Dr. Henry J Moller
PRAXIS Holistic Health
785 Carlaw Ave. Suite 101
Toronto, ON M4K 3L1 Canada
Faculty of Medicine,
Knowledge Media Design Institute,
University of Toronto
drmoller@praxisholistic.ca

Lee J Saynor
PRAXIS Holistic Health
785 Carlaw Ave. Suite 101
Toronto, ON M4K 3L1 Canada
Digital Futures Initiative,
OCAD University
lsaynor@praxisholistic.ca

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Abstract

A major barrier to efficient standardized clinical assessment is usability, including user-interface when completing clinical intake and follow-up. This is of concern for many clinicians who struggle to reliably obtain symptom report from an increasingly diverse population base in high-volume patient care settings. Given the reality that many patients have disabilities, cognitive limitations and language or technology illiteracy, it is clear that any intake tool needs to address this "digital divide" and obtain bottom-up user input in the design process, while being minimally constrained by barriers of language/culture/age/ability. An inclusive Electronic Medical Record (EMR) should also create a common perspective between provider and patient.

We present a novel digital platform for collection, analysis and visualization of healthcare data to address these gaps in patient care. The Wellpad EMR was developed according to Inclusive and Empathic Design principles, i.e. with the base assumption that a technology interface catering to users affected by disabilities would also be most usable and efficient to generic users. In our presentation, we will describe the prototyping and iterative design process, and report on the key features of Wellpad: ease-of-use, portability, versatility, data security, aesthetics and cross-cultural communication.

Author Keywords
Inclusive design; empathic design; privacy-sensitive design; electronic medical record (EMR); data visualization; mobile healthcare; tablet-based; multi-platform; holistic health; health communication.

ACM Classification Keywords
Human Factors; design; documentation; algorithm standardization; reliability; performance; management; security.

Introduction

In an era of "personalized medicine" (Woodcock, 2007) despite an increasingly diverse healthcare landscape, both patients and industry increasingly expect consumer-oriented healthcare solutions. Wellpad was designed in recognition of multiple deficits in currently available patient electronic medical records.

A major hindrance to efficient standardized clinical assessment is data-gathering and -display tool usability, including user-interface when completing clinical intake and follow-up. EMR systems typically gather data accurately, but are overwhelming or cumbersome to input and process, while creating a barrier between clinician and patient, and therefore interfering with the clinical encounter. Furthermore, EMR systems generally fail to provide a common language between doctor and patient. In an increasingly diverse society with respect to culture, language, age and digital literacy, it seemed important to use Inclusive Design principles.

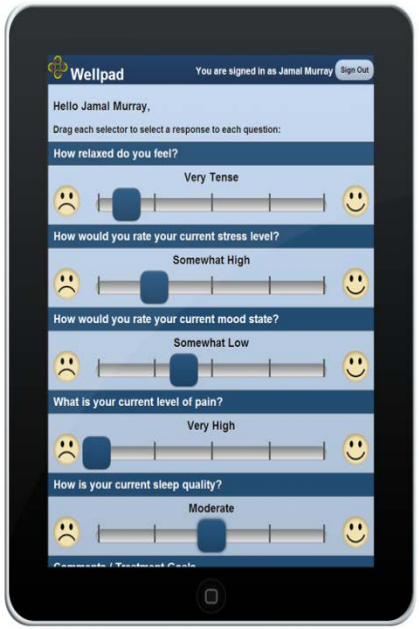

Figure 1 - User/patient front-end. UI Touch Sliders are easy to understand, manage symptom report across five health/wellbeing domains.

As described by Nussbaum (2001), Inclusive Design has grown from the inception of the Americans with Disabilities Act in 1990 with a vision of creating easy-to-use, accessible, aesthetically pleasing environments, products and technologies optimized for a total population- including the aging, illiterate or differently abled. Curiously, these principles have not been used with terrific success in the primary care of those with medical ailments—the very population from whom this design movement has originated. Also still lacking is a type of "*Esperanto*" of health communication- a universal language that bridges the gap between patient and doctor/circles-of-care, while accommodating the growing reality of diversity in a global community with common health concerns but often differing language and culture.

Frustration of healthcare providers in entering and analyzing rote symptom checklists in context of often rushed clinical encounters was also considered. We developed a replicable, visually appealing and icon-based slider panel for patient symptom inquiry that would allow patients to autonomously provide a health and wellbeing report using touchpad slider bars and emoticon (smiley/frowny face) endpoints for symptom self-report, with elements of empathic design, gamification, and responsive aesthetics to engage clients as described by Crossley (2003) and Marti (2012).

Figure 2 - Sample 12 month data visualization: instant profile of a patient's EMR-recorded health journey.

Theoretical Framework for Features:
In patient/user interface front-end, we focused on iconic rather than language-based touchpad symptom representation to address issues of cross-cultural and technological literacy/inclusiveness. In clinician/researcher back-end, we focused on features that could serve as EMR and demographic analysis for clinical encounters, provide standardized symptom tracking, and allow simple yet aesthetically pleasing data visualization to serve as a communication tool between doctor-patient or researcher with industry or academia.

Developed as a broad-spectrum health assessment tool, Wellpad's tablet-based sliding scale employs culture-neutral icons allowing assessment of five generic core wellbeing domains used in intake and follow-up for a holistic health assessment: stress-perception, relaxation, sleep quality, mood state, and pain perception. We have previously described clinical application of a similar symptom survey panel for use in a stress-reduction clinical protocol (Moller & Bal, 2013, Moller et. al 2014).

Therapeutic medicine (if any), dosage, and current treatment goals may be updated on recurrent assessments in conjunction with symptom fluctuation, and these are represented graphically in simple and visually appealing format. An automated EMR patient visit record is also established in conjunction with this process, allowing for usability in busy and/or high-volume practice settings.

Early in-the-field experience with over 500 patients shows excellent ease-of-use (i.e. usability) for clinicians, patient user acceptance, and most importantly, enhanced doctor-patient communication regarding symptoms, treatment and therapeutics selection/modification.

In our presentation, we describe the iterative design process, and report on the key features of Wellpad: usability, reliability, efficiency, inclusiveness and versatility that could allow this tool to become industry standard to serve the medical and research community.

Average Workflow:
Our tool is designed to optimize workflow, minimize frustration and miscommunication between healthcare provider and consumer, and encourage client autonomy.

1. Doctor/Provider (Admin user) adds new clients to system with basic personal info

2. Client signs in, accepts Liability Waiver on first use.

3. Client completes accessibly-designed icon-based intake survey (5x sliders, therapeutic agent, dosage, treatment goals, additional comments), submits. Automated EMR patient visit record is established.

4. Provider can retrieve Questionnaire Responses as text, OR if there has been a follow-up: as a time-based data visualization graph, to track treatment progress. Drop-down menu allows variation from default 3-month time-line.

Security Features:
Security features are designed to restrict inappropriate or unauthorized access, specifically in light of sensitive patient data. Hosted database is device independent and accessible remotely with appropriate permission.

- SSL (Secure Sockets Layer) allows use of Wellpad on public Wi-Fi networks, protects communication against phishing

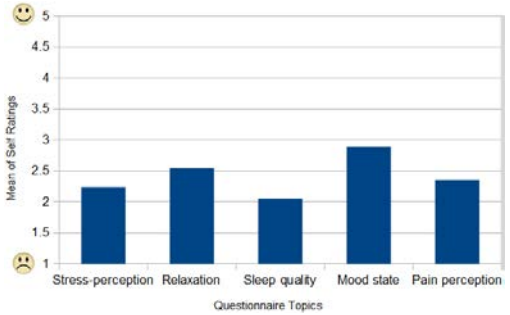

Figure 3 - Mean Self-Ratings for Wellpad Medical Wellness Inventory in 46 consecutive patients attending a Holistic Health Centre, prior to treatment.

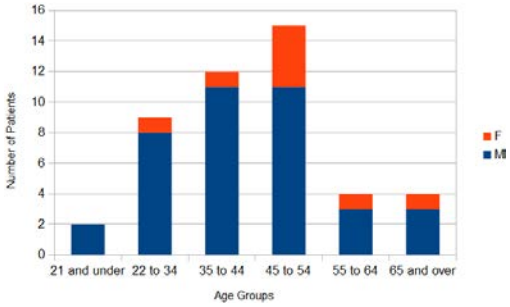

Figure 4 - Most recent 46 patients to use Wellpad categorized by sex and age group.

Figure 5 - Geo-mapping of patient home region—used for defining clinic population base.

Patient database is secured through custom hashing/encryption algorithm in case of unauthorized database access.

Summary

We chose to develop Wellpad according to Inclusive and Empathic Design principles, i.e. with the base assumption that a technology interface catering to users affected by disabilities would also be most usable and efficient to generic users including healthcare providers. To this end, Wellpad achieves Pareto efficiency (Barr, 2012) and is true to inclusive design principles.

In our presentation, we will describe the prototyping and iterative design process, and report on the key features of Wellpad: usability, reliability, efficiency, aesthetics, inclusiveness and versatility that could allow this tool to become industry standard to serve the healthcare community and industry.

References

Barr, Nicholas (2012). The relevance of efficiency to different theories of society". *Economics of the Welfare State* (5th ed.). Oxford University Press. p. 46. ISBN 978-0-19-929781-8

Crossley, L. (2003) Building Emotions in Design. *The Design Journal* 6 (3): 35–45

Marti, P. (2012). Enabling through Design: *Explorations of Aesthetic Interaction in Therapy and Care*. Eindhoven: Technische Universiteit Eindhoven.

Moller, H.J., Bal, H. (2013) Technology-enhanced multimodal meditation: Clinical results from an observational case series. *Proc 10th International Conference on Virtual Rehabilitation*, Philadelphia, PA, USA, Aug 26-29. 2013, 1-9.

Moller, H.J. Sudan, K., Khan, O. Bal, H. (2014). Recreating Leisure: How Immersive Therapeutic Environments Promote Wellbeing. *Proc 14th Canadian Congress on Leisure Research*. Halifax, NS, CA, May 21-23, 2014. 216-220

Nussbaumer, L.L. *Inclusive Design: A Universal Need*, Fairchild Books, New York City (2001) ISBN-13: 978-1563679216

Woodcock, J. (2007). The prospects for "personalized medicine" in drug development and drug therapy. *Clinical Pharmacology & Therapeutics,* 81(2), 164-169.

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