Nurse Education Today 84 (2020) 104240

Contents lists available at ScienceDirect

Nurse Education Today

journal homepage: www.elsevier.com/locate/nedt

Are student nurses ready for new technologies in mental health? Mixed-methods study

Alexis Bourla[a,d,*,1], Stéphane Mouchabac[a,1], Laetitia Ogorzelec[b], Christian Guinchard[b], Florian Ferreri[a,c], In collaboration with[2]

[a] Sorbonne Université, Department of Adult Psychiatry and Medical Psychology, APHP, Saint-Antoine Hospital, F-75012, Paris, France
[b] Sociology and Anthropology Laboratory (LaSA - EA 3189), University of Burgundy Franche-Comté, Besançon, France
[c] Sorbonne University Nurse Department, Pitié Salpêtrière AP-HP, F-75013 Paris, France
[d] Jeanne d'Arc Hospital, INICEA Group, Saint-Mandé, France

ARTICLE INFO

Keywords:
Ecological momentary assessment
Digital phenotyping
Computerized adaptive testing
Professional culture
Acceptability

ABSTRACT

Background: Technical innovations such as ecological momentary assessment (EMA), machine learning (ML), computerized adaptive testing (CAT), Digital Phenotyping, Clinical Decision Support Systems (CDSS), Algorithms, and Biomarkers have caused a paradigm shift in psychiatric care. The aim of the present study was to explore how student nurses view this paradigm shift, by assessing the acceptability of smartphone-based EMA, CAT, and biosensor-based Digital Phenotyping. We also investigated the factors affecting this acceptability.

Method: Student nurses recruited via nursing schools participated in a quantitative study involving the *screen-play method*, in which they were exposed to two scenarios about depression care, one featuring EMA and CAT, the other featuring a connected wristband (CW) for Digital Phenotyping. Four acceptability domains (usefulness, usability, reliability, risk) were investigated.

Results: We recorded 1216 observations for the first scenario and 1106 for the second. Regarding overall acceptability, the CW was viewed less positively than CAT and EMA. Regarding reliability, whereas respondents believed that the CW could correctly detect depressive relapse, they did not think that EMA and CAT were sufficiently reliable for the accurate diagnosis of depressive disorder. More than 70% of respondents stated that they would nevertheless be interested in offering EMA, CAT or CW to their patients, but more than 60% feared that these devices might hinder the therapeutic relationship.

Conclusion: This was the first study assessing student nurses' views of EMA, CAT and CW-based digital phenotyping. Respondents were interested in these new technologies and keen to offer them to their patients. However, our study highlighted several issues, as respondents doubted the reliability of these devices and feared that they would hinder the therapeutic relationship. Subgroup analysis revealed correspondences between acceptability profiles and demographic profiles. It is therefore essential for nurses and student nurses to receive training and become involved in the development of this new technologies.

* Corresponding author.
E-mail address: alexis.bourla@aphp.fr (A. Bourla).
[1] AB and SM are co-first authors (contributed equally).
[2] Sylvie Larsonnier, Director of Chaptal School of Nursing, Sarcelles, France
Nicolas Cabero, Director of Charles Foix School of Nursing, Ivry-sur-Seine, France
Soraya Fekkar, Director of School of Nursing, Rueil Malmaison, France
Béatrice Fetiveau, Director of Didot School of Nursing, Paris, France
Franck Gautier, Director of Mantes la Jolie School of Nursing, Mantes la Jolie, France
Ellen Hervé, Director of Picpus School of Nursing, Paris, France
Farida Khennan, Nurse Department, Sorbonne University, Pitié-Salpêtrière Hospital, Paris, France
Valérie Leroux, Director of Fondation Œuvre de la Croix Saint-Simon School of Nursing, Montreuil, France
Nicole Pierre-Poulet, Director of Tenon School of Nursing, Paris, France
Claire Riglet, Director of French-British Hospital Institute School of Nursing, La Défense, Puteaux, France
Lucie Rigollet, Nurse Department, Sorbonne University, Pitié-Salpêtrière Hospital, Paris, France
Danielle Sebanne, Deputy Director, Pitié-Salpétrière School of Nursing, Paris, France
Solange Vasselon, Deputy Director of Villeneuve Saint-Georges School of Nursing, Villeneuve Saint-Georges, France.

https://doi.org/10.1016/j.nedt.2019.104240
Received 31 March 2019; Received in revised form 26 July 2019; Accepted 8 October 2019

1. Introduction

New technologies have the potential to profoundly change the way we understand psychiatric disorders and are now used in almost all areas of psychiatry, including mood disorders (Bourla et al., 2017), addictive disorders (Ferreri et al., 2018), posttraumatic stress disorder (Bourla et al., 2018a), and obsessive-compulsive disorder (Ferreri et al., 2019a). A large number of innovative tools are currently being developed for the computer-assisted detection and course prediction of mood disorders, mainly using artificial intelligence and digital phenotyping.

First introduced by Jain (Jain et al., 2015), and subsequently developed by Torous (Torous and Gualtieri, 2016) in the field of psychiatry, the concept of Digital Phenotyping refers to the *capture* by biosensor-based tools of specific psychiatric symptoms that are *objectifiable* and *quantifiable*. For example, the graphorrhea observed in manic episodes can be reflected in an increase in the number of text messages (SMS) sent, while psychomotor retardation in depression can be assessed by an accelerometer. These passive data are collected in background tasks for which no intervention is necessary. Collection may involve either a smartphone and its onboard sensors (GPS, accelerometer, verbal flow detector, etc.) or a connected wearable device (e.g. connected wristband CW), both of which allow for realtime biometric monitoring. Several models based on this concept are beginning to emerge in the areas of schizophrenia (Torous et al., 2017) and mood disorders (Bourla et al., 2017). Data can also be actively collected. Smartphone-based ecological momentary assessment (EMA) consists of the evaluation of symptoms from day to day (like a symptom diary), in the patient's habitual environment. Participants self-assess *right then, not later; right there, not elsewhere*, so that there are fewer recall biases (Csikszentmihalyi and Larson, 1987; Firth et al., 2016). All these new technologies can be seen as either an aid or, on the contrary, a constraint or even a hindrance to the therapeutic relationship. A recent study of psychiatrists' attitudes toward these new technologies showed that overall acceptability was only moderate, and all systems were described as carrying a potential risk (79.6%) (Bourla et al., 2018b).

Nurses play a central role in patient care, especially in psychiatry, where they have a well-defined role combining a psychotherapeutic dimension with a clinical one. In addition, new treatments for complex psychiatric disorders (e.g. organic psychiatric disorders) involve a higher level of technical work (Ferreri et al., 2019b). It is therefore important to assess nurses' knowledge, representations, opinions and attitudes toward these new technologies, which will inevitably modify the way they care for their patients. Do they think that these devices will negatively impinge on the care they provide? Or, on the contrary, do they think they will enrich the therapeutic relationship? Do they think they are useful? Could these devices save them time? Do they result in a more technical representation of psychiatry?

In France, nurse training is available for postgraduate students. It takes place over 3 years (i.e. six semesters). In accordance with the European Credit Transfer System (ECTS), the nursing diploma certifies a validated level by obtaining 180 ECTS (120 for teaching units and 60 for clinical nursing practice). Among the different clinical training, a 10-week clinical practice in psychiatry (internship) is compulsory during the course.

The main objective of the present study was to analyze how student nurses view these new technologies, by assessing the acceptability of smartphone-based EMA, computerized adaptive testing (CAT), and CW-based digital phenotyping. To this end, we applied the screenplay method (vignette methodologies) (Evans et al., 2015; Hughes and Huby, 2002), a validated model specifically developed to assess acceptability adopting a multidisciplinary approach (psychiatric and sociological). Our secondary objective was to identify the factors affecting this acceptability.

2. Material and method

We conducted a quantitative study via a paper-and-pencil questionnaire, in collaboration with the Sociology and Anthropology Laboratory (LaSA) of the University of Burgundy Franche-Comté. The questionnaire was administered to a cohort of student nurses in their first, second or third year of training, who took part on a voluntary basis. Data collection was machine based. Survey documentation was erased after the data had been encoded. The research was approved by the ethics committee that oversees nurse education in France.

2.1. Target population and sample composition

This study took place in July 2017, among a population of student nurses recruited through 10 nursing schools in the Paris region, France.

Table 1
Screenplay method.

	Scenario	Device tested & objective
1	You are working with Dr. D. (GP) in a clinic. Today, you see Mr. P, who is 25 years old. For several weeks, he has felt “very sad”. At the end of the clinical examination, Dr. D. suspects clinical depression. To make a more accurate assessment, he asks you to help Mr. P. respond to the CAT-DI questionnaire on a computer located in a side room off the waiting room. The CAT-DI is intelligent software that can evaluate depressive symptomatology as accurately as the validated scales, simply by asking a few questions and adapting them to the patient's answers. After analyzing the results of the CAT-DI, you conclude that Mr. P. does indeed have depressive symptomatology. Dr. D. suggests that the patient download the PsyEVAL application on his smartphone and use it for one week before coming back to see you. This app allows you to repeatedly evaluate the patient's mood using questions that are displayed several times a day on the phone. After 7 days, Mr P. comes back, and analysis suggests that Mr. P.'s depressive symptomatology is severe, thus enabling Dr. D. to tailor his care accordingly.	Detection and diagnosis of a mood disorder using CAT (Gibbons et al., 2012) and smartphone-based EMA in a young patient suspected of having a depressive disorder (Torous et al., 2015). Evaluate the acceptability of a machine making a diagnosis instead of a doctor.
2	Mrs V is 47 years old and has a recurrent depressive disorder that has been in remission for several months. She comes to see Dr. D. about once a month to renew her treatment. Overburdened by new requests for care, he can no longer keep up these monthly appointments, and therefore proposes seeing Mrs. V. again in 3 months' time. Anxious not to miss a depressive relapse, he suggests that she wear a CW to record biometric data and analyze their variations (e.g. modifications in motor activity, heart activity, skin conductance, temperature), allowing depression to be detected remotely and in real time. If warning signs are detected, the CW sends a signal and the patient is quickly offered an appointment to check her state. Dr. D. asks you to take the CW to Mrs. V's house, explain how it works, and then analyze the data.	Early detection of depressive relapse, using a CW (biosensors) (Burton et al., 2013) to establish the digital phenotype of a patient with a recurrent depressive disorder in remission. Investigate how the nurses view the impact of a connected object on their therapeutic relationship with their patients. Investigate how the nurses view the digital phenotype concept.