



## Nurses distracted by smartphone use during clinical practice: Italian validation of the “Nurses' use of Personal Communication Devices (PCD) questionnaire”



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### 1. Background

In healthcare as at home, digital technology is always a part of our everyday life. Regardless of social conditions or age, everyone has an electronic device (i.e. smartphone, tablet, personal computer), as it allows fast communication and internet connection. Technological evolution has altered modern society radically, particularly healthcare, where digital systems provide medical consultation (McBride, 2015), and improve patient education (Shepherd, Badger-Brown, & Legassic, 2012). Mobile health (MHealth) is a very important element for eHealth, supporting healthcare practice through mobile devices such as smartphones, tablets, patient monitoring devices, personalized digital diaries (PDAs) and other wireless devices. MHealth is emerging as a rapidly developing sector, promoting healthcare transformation, improving quality and efficiency. A study showed that 63% of nurses, during their clinical practice, use smartphones for personal purposes (Whitlow, Drake, Tullmann, Hoke, & Barth, 2014). There are many advantages to technology in a care setting, such as drug dosage calculation (Di Simone et al., 2018a), or communication improvement between multidisciplinary teams as reported in the study by Wu et al. (Wu et al., 2010). Nevertheless, smartphone use during the care process could cause distraction and medication errors (Di Simone et al., 2016), with negative consequences for the patients (Di Muzio, Tartaglino, De Vito, & La Torre, 2016a).

As the goal of all health care systems is to increase patient safety, distraction of the healthcare providers by electronic devices could serve as a potential risk towards that goal. Such concern is highlighted and shared by the World Health Organization (WHO), which as of 2001, asks for urgent action by the health organizations themselves. In a multicenter Italian study approximately 80% of intensive care unit (ICU) nurses answered that distractions, while preparing or administering IV drugs, might lead to medication errors (Di Muzio, De Vito, Tartaglino, & Villari, 2017). A survey conducted in the UK (Robinson et al., 2013) among medical students, demonstrated that 70% of them

associate smartphone usage with sending and/or reading e-mails and internet browsing. A study conducted by Katz-Sidlow highlighted that most interviewed doctors had been distracted by smartphone use during working hours (Katz-Sidlow, Ludwig, Miller, & Sidlow, 2012). While a separate study indicates that fatigue, physical or mental, can affect the use of the Internet during patient care (Lin, Tsai, Chen, & Koo, 2013). Several studies exhibit that interruptions during patient care are common in hospitals, (Schmucker, Heid, & Haag, 2014) contributing to errors in healthcare (Márquez-Hernández et al., 2019). Overall, this “distracted nursing” might affect patient care in a hospital setting and provide significant risk to their safety (McBride, Levasseur, & Li, 2013). A research showed how using a smartphone for personal purposes negatively influenced the interdisciplinary communication between Health Professions and could decrease the nurse's working performance (Fujino & Kawamoto, 2013). McBride and colleagues (McBride et al., 2013) have developed an instrument devoted to examining the impact of personal communication device usage (such as basic cell phones, enhanced cell phones or smartphones, and tablet computers) on patient care.

The questionnaire is composed of 30 multi-part questions, with four-domains (utilization, impact, opinions, and performance), resulting in a total of 50 items. It consists of questions used to obtain information about (a) demographics, (b) use of personal communication devices, (c) opinions about the electronic device's effects on the work of registered nurses, and (d) hospital policies concerning personal communication devices.

According to the authors (McBride et al., 2013), Nurses' Use of Personal Communication Devices Questionnaire (PCDs Questionnaire) may be used to explore registered nurses' perceptions of the impact that personal electronic devices have on hospital units in Italy. In the context of the Italian nursing education and health system, with patient safety as its theoretical and practical core-curriculum, it is necessary to support the management process of personal devices appropriately.

Validating an instrument such as the Nurses' Use of Personal

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Communication Devices Questionnaire (PCDs Questionnaire) in languages other than English can create a basis for international comparisons of nursing perceptions in patient safety management and reduce potential risks to patients across different settings, countries and professional cultures.

### 1.1. Aim of the study

The aim of this study was to assess the validity and reliability of the Nurses' Use PCDs Questionnaire in the Italian hospitals.

## 2. Methods

### 2.1. Instrument translation and face/content validation

Having obtained authorization from the authors, the instrument was translated into Italian. The backtranslation aims at verifying its cross-cultural adaptation. A native English-speaking nurse and a certified translator independently undertook the forward and backward translation. The two English versions obtained were analyzed and compared independently by two other translators and any discrepancies or errors were discussed with the previous translators.

The original questionnaire has been reduced to adapt it to the Italian reality (cultural adaptation) while some items have been merged together because they are repetitive.

Therefore, a total of 16 questions of the Nurses' Use PCDs Questionnaire (Italian version) were considered in our study with addition of socio-demographic data (6 questions).

### 2.2. Sampling, setting and data collection process

The questionnaire was validated by testing the questions' internal validity and reliability. It was tested on 193 nurses, working in Sapienza University hospital in Rome, Italy.

Sampling and data collection methods: self-administered questionnaire to nurses.

The questionnaire is preceded by a brief description in which details and the aim of the study are explained, protecting anonymity of participants (informed consent).

### 2.3. Statistical analysis

Data entered into a database using the program DB IV was processed with the statistical software SPSS® software (Statistical Package for Social Science) for Windows, version 22.0.

Descriptive analyses were performed using frequencies, percentages, and a frequency table for categorical variables.

With regard to a univariate analysis the appropriate statistical tests were used ( $\chi^2$  for categorical variables).

The questionnaire's reliability was evaluated by calculating with *Cronbach's alpha* (Cronbach, 1951), a measure of internal consistency. This is the ratio of the covariance sum of the scores of all questions and the total variance of them. Such parameter can be interpreted as an average of the correlation coefficients calculated for each possible division of questions into two groups of equal dimensions. The assessment's reliability of a scale consists in the estimation of how much of the score variation can be realistic, rather than being due to chance or casual errors. The reliability degree estimated from *Cronbach's alpha* is expressed as a decimal such as 0.70, in which the questionnaire or item can be considered 70% reliable (Nunnally, 1978).

Finally, the Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity test was performed to evaluate if a principal component analysis (PCA) could be performed on the dataset.

Data was collected between July 2018 and September 2018.

**Table 1**  
Demographic and personal characteristics of the responding nurses.

Variables	n	(%)	P-value*
Total	193	100	
Age, years (193) <sup>a</sup>			
< 30	31	(16.0)	< 0.001
31–40	65	(33.7)	
41–50	59	(30.6)	
> 51	38	(19.7)	
Gender (193) <sup>a</sup>			
Male	68	(35.2)	< 0.001
Female	125	(64.8)	
Educational qualification (193) <sup>a</sup>			
University degree in nursing (BSN, MSN)	157	(81.3)	< 0.001
Non-university qualification (regional course)	36	(18.7)	
Postgraduate training courses (185) <sup>a</sup>			
Master	185	(100)	< 0.001
Other (PhD)	0	(0)	
Years of Work (193) <sup>a</sup>			
< 1	3	(1.6)	< 0.001
1–5	23	(11.9)	
6–10	46	(23.8)	
> 10	121	(62.7)	
Workplace setting (193) <sup>a</sup>			
Medical ward	78	(40.4)	< 0.001
Surgical ward	70	(36.3)	
Intensive care unit	35	(18.1)	
Pediatric ward	9	(4.7)	
Other	1	(0.5)	

<sup>a</sup> Number of nurses responding to the question.

\* Chi-square.

### 2.4. Ethics

The approval of the Ethics Committee of Sapienza University of Rome (# 1188/17) for the administration of the questionnaire, with acknowledgement of notification for the study, was required.

## 3. Results

### 3.1. Sociodemographic characteristics of the sample

The sample consisted of 193 nurses.

The average age among the sample was 41.6 years (SD  $\pm$  9.8) with 35.2% males and 64.8% females. Overall, 59.6% of the sample had a University degree in Nursing (50.0% had Master's Degree [Table 1]) while 21.8% did not, and 18.7% had other educational qualifications.

### 3.2. Validation of the questionnaire

The highest Cronbach's alpha value among the three sections: performance, utilization, and impact resulted on 19 questions out of 22 (alpha = 0,780).

Reliability analysis, known as the correlation of the correct total questions and the variability of *Cronbach's alpha* of a question is excluded, but demonstrated in the Table 2 [Performance, Utilization, Impact].

The minimum acceptable level for the comparison between groups of individuals does not require a high coefficient: values between 0.50 and 0.70 are considered acceptable (Nunnally, 1978).

### 3.3. Performance

The majority of the sample (86.5%) considered personal smartphone usage for nonwork-related activities not to be a distraction

**Table 2**  
Responding nurses: performance scale.

Item performance	0 Strongly disagree n (%)	1 Disagree n (%)	2 Agree n (%)	3 Strongly agree n (%)
Performance 1: The use of my personal communication device for non-work related activities has distracted me while working (193) <sup>a</sup>	101 (52.3)	66 (34.2)	24 (12.4)	2 (1.0)
Performance 2: The use of my personal communication device improve my performance while working (193) <sup>a</sup>	45 (23.3)	75 (38.9)	66 (34.2)	7 (3.6)
Performance 3: The use of my personal communication device for non-work related activities has negatively effected my performance while working (193) <sup>a</sup>	151 (78.2)	37 (19.2)	4 (2.1)	1 (0.5)
Performance 4: Personal communication device use at work for non-work related activities improves my ability to focus on my work (193) <sup>a</sup>	118 (61.1)	53 (27.5)	21 (10.9)	1 (0.5)
Performance 5: I have witnessed another nurse whose personal communication device use was negatively effecting his/her performance while working (193) <sup>a</sup>	19 (9.8)	37 (19.2)	63 (32.6)	74 (38.3)

<sup>a</sup> Number of nurses responding to the question.

**Table 3**  
Responding nurses: utilization scale.

Item utilization	0 Never n (%)	1 Once per shift n (%)	2 2–5 times per shift, n (%)	3 > 5 times per Shift, n (%)
Utilization 1: I access work drug references (193) <sup>a</sup>	23 (11.9)	76 (39.4)	79 (40.9)	15 (7.8)
Utilization 2: I use the device as a calculator for nursing/medical formulas (193) <sup>a</sup>	38 (19.7)	69 (35.8)	67 (34.7)	19 (9.8)
Utilization 3: I access work-related protocols/guide lines (193) <sup>a</sup>	88 (45.6)	71 (36.8)	22 (11.4)	12 (6.2)
Utilization 4: I access work-related Health Apps that assist my patient care (193) <sup>a</sup>	138 (71.5)	37 (19.2)	13 (6.7)	5 (2.6)
Utilization 5: I call or check/send work related text messages or emails to other members of the healthcare team (193) <sup>a</sup>	58 (30.1)	68 (35.2)	56 (29.0)	11 (5.7)
Utilization 6: I call or check/send text messages or emails to family or friends (Facebook, Whatsapp, Twitter, etc.) (193) <sup>a</sup>	51 (26.4)	80 (41.5)	51 (26.4)	11 (5.7)
Utilization 7: I check/post on social networking sites (193) <sup>a</sup>	73 (37.8)	75 (38.9)	37 (19.2)	8 (4.1)

<sup>a</sup> Number of responding nurses.

**Table 4**  
Responding nurses: impact scale.

Item impact	0 Strongly disagree n (%)	1 Disagree n (%)	2 Agree n (%)	3 Strongly agree n (%)
Impact 1: Does the use of personal communication device promote communication between the members of the care team? (193) <sup>a</sup>	21 (10.9)	48 (24.9)	109 (56.5)	15 (7.8)
Impact 2: Does Personal communication device use improve patient safety? (193) <sup>a</sup>	18 (9.3)	87 (45.1)	87 (45.1)	1 (0.5)
Impact 3: Does Personal communication device use reduce work-related stress? (193) <sup>a</sup>	21 (10.9)	93 (48.2)	76 (39.4)	3 (1.6)
Impact 4: Does Personal communication device use increase medical errors while working? (193) <sup>a</sup>	10 (5.2)	64 (33.2)	88 (45.6)	31 (16.1)

<sup>a</sup> Number of nurses responding to the questions.

[Table 2], while 13.4% of nurses agreed that personal communication devices contribute as a distraction ( $P < 0.001$ ).

Whereas 97.4% of the nurses admitted that using personal communication devices for nonwork-related activities hasn't negatively affected their work performance ( $P < 0.001$ ).

Almost all (88.6%) agreed that using a personal communication device for nonwork-related activities has helped them to focus on their work. Over 70% of the sample, answered that they have not witnessed another nurse making a medical error that was the result of distraction caused by his/her use of a personal communication device ( $P < 0.001$ ).

### 3.4. Utilization

Almost 50% of the sample use electronic devices to access work-related drug references [Table 3]. This aspect could reduce medication errors during the drug preparation phase and administration (Di Muzio, Marzuillo, De Vito, La Torre, & Tartaglino, 2016b).

Only 44.5% (2–5 times per day and > 5 times per day) of the nurses used the device as a calculator for nursing/medical formulas ( $P < 0.001$ ). The literature highlights that drug dosage calculations are

essential to reduce medication errors during the drug preparation phase (Di Simone et al., 2018b). Our study highlights that only 17.6% of the sample used work-related protocols ( $P < 0.001$ ).

Almost all of the nurse from the sample (90.7%) did not use work-related apps to assist patient care ( $P < 0.001$ ), and 65.3% of the sample did not use personal communication devices to communicate with other members of the health care team to coordinate patient care ( $P < 0.001$ ). An important aspect, shared by > 30% of nurses, admit to checking/posting on social networking sites (Facebook, Twitter, etc) and 23.3% used personal communication device (smartphone or iPhone) to surf on internet (shop on the internet, email, business on line, etc) ( $P < 0.001$ ). This utilization of personal communication devices could cause a distraction while working.

### 3.5. Impact

Almost 65% agreed that the use of personal communication devices in nursing units improve coordinated patient care among nursing/medical teams ( $P < 0.001$ ) [Table 4]. A minority of respondents (41%) believe that their personal device usage at work had a positive effect on their work, including reducing stress ( $P = 0.012$ ). Almost 62% of the

**Table 5**  
Item-Total Statistics - Item-total correlation and variability of Cronbach's alpha, if one item was deleted.

Item	Scale mean if the item was deleted	Variance in scale if the item was deleted	Corrected total correlation of the items	Chronbach's alpha if the item was deleted
Performance 1: The use of my personal communication device for non-work related activities has distracted me while working.	17,05	35,643	,192	,781
Performance 2: The use of my personal communication device improve my performance while working.	16,49	31,814	,574	,751
Performance 3: The use of my personal communication device for non-work related activities has negatively effected my performance while working.	17,42	36,850	,125	,783
Performance 4: Personal communication device use at work for non-work related activities improves my ability to focus on my work.	17,17	33,264	,505	,759
Performance 5: I have witnessed another nurse whose personal communication device use was negatively effecting his/her performance while working.	15,67	33,898	,259	,780
Utilization 1: I access work drug references.	16,23	31,739	,609	,749
Utilization 2: I use the device as a calculator for nursing/medical formulas.	16,33	32,096	,484	,759
Utilization 3: I access work-related protocols/guide lines	16,89	33,858	,318	,773
Utilization 4: I access work-related Health Apps that assist my patient care.	17,27	34,146	,376	,768
Utilization 5: I call or check/send work related text messages or emails to other members of the healthcare team.	16,57	32,892	,405	,766
Utilization 6: I call or check/send text messages or emails to family or friends (Facebook, Whatsapp, Twitter, etc.).	16,56	32,550	,465	,760
Utilization 7: I check/post on social networking sites.	16,78	32,559	,472	,760
Impact 1: Does the use of personal communication device promote communication between the members of the care team?	16,06	33,829	,378	,768
Impact 2: Does Personal communication device use improve patient safety?	16,31	34,088	,439	,765
Impact 3: Does Personal communication device use reduce work-related stress?	16,36	33,814	,454	,763
Impact 4: Does Personal communication device use increase medical errors while working?	15,95	37,581	-,033	,799

**Table 6**  
Kaiser-Meyer-Olkin and Bartlett's Test.

Kaiser-Meyer-Olkin measure of sampling adequacy.		,784
Bartlett's test of sphericity	Approx. Chi-Square	1042,782
	df	120
	Sign.	,000

**Table 7**  
Communalities.

	Initial	Extraction
Performance 1	1000	,502
Performance 2	1000	,600
Performance 3	1000	,677
Performance 4	1000	,399
Performance 5	1000	,728
Utilization 1	1000	,729
Utilization 2	1000	,596
Utilization 3	1000	,761
Utilization 4	1000	,579
Utilization 5	1000	,533
Utilization 6	1000	,680
Utilization 7	1000	,536
Impact 1	1000	,609
Impact 2	1000	,707
Impact 3	1000	,613
Impact 4	1000	,443

Extraction Method: Principal Component Analysis.

**Table 8**  
Total variance explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	4351	27,192	27,192	4351	27,192
2	2367	14,792	41,984	2367	14,792
3	1820	11,373	53,357	1820	11,373
4	1155	7222	60,578	1155	7222

Extraction Method: Principal Component Analysis.

sample admitted that the use of personal communication devices could increase the risk of medical errors ( $P = 0.001$ ).

The KMO value was 0.784 and the Bartlett sphericity test was significant ( $\chi^2 = 1042,782$ ,  $df = 120$ ,  $p < 0.001$ ), indicating that the factor analysis of the data is appropriate [Tables 6, 7 and 8].

#### 4. Discussion

The present study describes a validation process to examine an Italian psychometric developed questionnaire concerning the registered nurses' views on the impact of personal communication device usage in health care settings.

Nurses reported that personal communication devices were always or often a distraction while working. Respondents acknowledged their own device use negatively affected their work performance (13.4%), or could increase the risk of medical errors (62%). Medication errors represent the most common error class which can occur in hospitals (Di Muzio et al., 2017, 2019)

Respondents perceived the most beneficial smartphone functions in care settings to be accessing information about medications, procedures, and diseases (Flynn, Polivka, & Behr, 2018). According to literature (McBride, 2015), > 70% of the sample, answered that they have not witnessed another nurse making a medical error that was the result of distraction caused by his/her use of a personal communication device.

A relevant aspect related to the performance section concerns the personal skills improvement. Only 37.8% admitted that using a personal communication device for nonwork-related activities helped them to improve their professional skills.

The use of personal communication devices by nurses to refresh protocols and guide lines could improve nursing knowledges (McBride & LeVasseur, 2017).

According to the available literature (McBride & LeVasseur, 2017), safety concerns were reported only by 54.4% of respondents who believed that mobile phones introduced a potentially significant safety risk to patients while working ( $P = 0.221$ ).

In line with the scientific data reported by the literature, this study highlights that almost all of the sample relate the performance section with the improvement of personal skills (Valle, Godby, Paul 3rd, Smith, & Coustasse, 2017). Almost all of the sample (90.7%) did not use work-related apps that assist patient care; however, this is not confirmed by nursing students that have a unique perspective on how smartphones and mobile apps can support learning in clinical practice (O'Connor & Andrews, 2018).

An encouraging data includes the percentage of nurses who admitted that the use of personal communication devices could increase the risk of medical errors.

#### 5. Conclusions

The Italian version of the tool, Nurses' Use PCDs Questionnaire (Italian Version), reported high internal consistency (from a 0.749 to 0.799) [Table 5], however slightly lower than what was reported for the original version (from a 0.84 to 0.96) (McBride et al., 2013). Nurses reported that personal communication devices were always or often a distraction while working.

A minority of nurses in our study agreed that PCD use can be a significant distraction while providing in patient care. A survey conducted in 2013 by Fujino et al. demonstrated how the PCD use could negatively influence the interdisciplinary communication among health professions and has potential to decrease a nurse's performance. Although many Italian hospitals lack common regulation outlining PCD use by clinicians at work, frequently hospitals allow workers to decide on their own how and when to use their devices. However, most nurses acknowledge the risks associated with the use of their mobile phones in a workplace environment and how this can appropriately modify their behavior. Guidelines on PCD use should be developed to reduce the potential for distraction and preventing medical errors.

This research is only the starting point of an Italian multi-center study which aims to stress the predictors of distraction from PCD use in nurses.

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