

# Smartphone and mobile technology use among the dental profession

## Précis

Technical support and digital professionalism training are required to facilitate the appropriate use of smartphone technology for dental clinicians practising in the Republic of Ireland.

## Abstract

**Statement of the problem:** Smartphone technologies have changed the landscape of digital communication across society. The Covid-19 pandemic has accelerated the adoption of and requirement for technical solutions to facilitate remote clinical communications. Despite the benefits of smartphones in a clinical communication context, there are risks associated with their use.

**Purpose of the study:** The primary purpose of this study was to determine the extent of smartphone use among dental professionals in the Republic of Ireland (ROI). In addition, we sought to determine the perception and knowledge of potential pitfalls, risks, and limitations of these technologies among the same population. A smaller cohort of UK dental professionals was surveyed for comparison.

**Materials and methods:** An online quantitative survey was distributed to evaluate dental professionals' knowledge and understanding of the risks and limitations of smartphone and mobile technology, providing general understanding of the current use of smartphone technology in healthcare in the ROI and the UK.

**Results:** A total of 123 responses were received from dental professionals in the ROI (UK: n=77). The majority of dental professionals confirmed that they were aware of the risks associated with smartphone use and perceived that they were adequately skilled in digital professionalism. However, concerning practice regarding the communication of sensitive patient data was identified, with the potential for these data to be stored on insecure devices and cloud servers. Many ROI and UK dental professionals confirmed that they would need support to remove patient-identifying data when trading in their device.

**Conclusions:** App, smartphone and mobile device ownership among dental professionals for clinical communications is widespread in the ROI (and UK), with respondents using their devices to send images (photos and radiographs) to one another. However, the risks of such activities are only partly acknowledged, with many having a lack of insight into data security.

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## Introduction

There is an ever-increasing accessibility and availability of smartphone and mobile technology across society. The functionality of these 'bring your own devices' (BYODs) is vast, enabling a range of current media-rich communications between users.<sup>1</sup> From simple text messaging or image sharing (clinical photos and/or radiographs), to video conferencing, the

intention of digital clinician communications is to improve patient care.<sup>2</sup> These technologies were widely adopted across healthcare during the Covid-19 pandemic, when minimising in-person meetings led to the heightened use of BYODs and digital solutions to aid remote and efficient clinical communication between clinicians and their patients.<sup>3</sup> Clinical communications using BYODs have been the subject of a recent scoping



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**Table 1: Age and gender demographics of respondents.**

Age (years)	Republic of Ireland			United Kingdom		
	Female	Male	Total	Female	Male	Total
20-29	5 (6%)	1 (2%)	6 (5%)	6 (13%)	–	6 (8%)
30-39	20 (26%)	3 (7%)	23 (19%)	17 (36%)	5 (17%)	22 (29%)
40-49	16 (21%)	9 (20%)	25 (20%)	14 (30%)	7 (23%)	21 (27%)
50-59	21 (27%)	15 (33%)	36 (29%)	8 (17%)	11 (37%)	19 (25%)
60-69	15 (19%)	14 (30%)	29 (24%)	2 (4%)	6 (20%)	8 (10%)
>70	–	4 (9%)	4 (3%)	–	1 (3%)	1 (1%)
<b>Total</b>	<b>77 (63%)</b>	<b>46 (37%)</b>	<b>123 (100%)</b>	<b>47 (61%)</b>	<b>30 (39%)</b>	<b>77 (100%)</b>

**Table 2: Dental professional and employment demographics.**

Dental role	Republic of Ireland	United Kingdom
	Total	Total
Dentist	92 (75%)	55 (71%)
Dental specialist	22 (18%)	18 (24%)
Dental hygienist	1 (1%)	0 (0%)
Clinical dental technician	0 (0%)	1 (1%)
Dental nurse	8 (6%)	3 (4%)
<b>Main employment</b>		
Public sector	45 (37%)	55 (71%)
Private sector	78 (63%)	22 (29%)

review, which demonstrated knowledge gaps around digital security and risk assessment for the security of clinical data.<sup>3</sup> Health professionals must demonstrate the appropriate competence or skill when using digital media (digital professionalism), and yet security and privacy issues are often absent from or only superficially acknowledged in the published literature.

Despite the clear advantages of improved clinical communication for all, the implementation of the European Union (EU) General Data Protection Regulation (GDPR)<sup>4</sup> resulted in increased regulatory requirements around the technology for hosting and processing sensitive data. This, along with the catastrophic cyberattack on the Health Service Executive (HSE) in 2021, resulted in growing concern around the use of digital modalities for clinical communication for everyone involved in current healthcare/dental practice in Ireland.<sup>2</sup> Given their ubiquitous nature and the potential for sensitive patient data to become compromised, it is timely to determine the culture of smartphone use among the dental profession.

### Materials and methods

An online questionnaire was adapted (with the permission of the authors) from relevant published studies in the Republic of Ireland (ROI) and the United Kingdom (UK)<sup>5,6</sup> to explore BYOD smartphone and mobile technology use among dental professionals. Ethical approval was granted (UCC Ref: 018-131) for dissemination of a Google Form weblink to dentists and the wider dental profession (dental specialists, dental hygienists, dental nurses, etc.). The invitation to complete the questionnaire provided a convenient sample open to any dental care professional in the ROI (and UK). The questionnaire included the anonymous demographic characteristics of each individual, current use of BYOD smartphones and mobile technology for communicating patient data, and the level of perceived risk associated with their use. The questionnaire was a blend of closed- and open-style questions to allow free text/elaboration. The ROI questionnaire was distributed as a weblink across a number of organisations: Cork University

Dental School and Hospital (May 2020); a Dental Council of Ireland newsletter to all registrants (August 2020); an Irish Dental Association webinar (October 2020); online attendees to the Irish Division of the International Association of Dental Research (February 2021); and, the Orthodontic Society of Ireland (March 2021). Plans for wider dissemination at face-to-face conferences that had been planned were curtailed due to the Covid-19 pandemic. UK dissemination of the questionnaire was undertaken through the British Dental Association and the British Association of Oral Surgeons. The resulting data are presented descriptively with no statistical analysis undertaken.

### Results

#### Respondent demographics

A total of 123 dental professionals from the ROI and 77 dental professionals from the UK completed the online survey. A similar gender balance was observed between the ROI (females n=77; 63%) and UK (females n=47; 61%) (Table 1). A wide age range for respondents was observed, with respondents in the 20-29 and >70 year categories in both jurisdictions. The majority of ROI respondents were in the 50- to 59-year age category (n=36; 29%), and for the UK the largest number of responses were seen in the 30- to 39-year age category (n=22; 29%).

The vast majority of ROI respondents were dentists in general practice (n=92; 75%), or dentists in specialist practice (n=22; 18%), with smaller numbers of dental hygienists, dental technicians and dental nurses (Table 2). A similar distribution pattern was observed for respondents from the UK.

The demographic relating to employment type differed between the ROI and the UK – a much higher percentage of respondents work in the private sector in the ROI (n=78; 63%) than in the UK (n=22; 29%).

#### Current use of smartphones and mobile technology for communicating patient data

High levels of smartphone use were observed among respondents (ROI 98%; UK 100%), with the Apple iPhone the most popular device (ROI n=78; 63%, and UK n=58; 75%). Android devices were less popular in the ROI (n=41; 33%) and UK (n=18; 23%), with the remainder using “other devices”.

Respondents were asked to answer questions in the following domains (Table 3):

- **Technological skills:** A majority of respondents from both jurisdictions (ROI n=105; 85%; UK n=71; 92%) perceived that they had an “appropriate level of technological skill to use a smartphone”, although this belief was not evenly distributed across employment type in the ROI. The majority of those ROI respondents who perceived that they did not

**Table 3: Current use of smartphones and mobile technology for communicating patient data.**

			Republic of Ireland			United Kingdom		
			Total	Public	Private	Total	Public	Private
1	Technological skills	Yes	105 (85%)	42 (34%)	63 (51%)	71 (92%)	50 (65%)	21 (27%)
		No	18 (15%)	3 (2%)	15 (12%)	6 (8%)	5 (6%)	1 (1%)
2	Usefulness	Yes	95 (77%)	34 (28%)	61 (50%)	70 (91%)	49 (64%)	21 (27%)
		No	28 (23%)	11 (9%)	17 (14%)	7 (9%)	6 (8%)	1 (1%)
3	Sending images by instant messaging and/or app	Yes	78 (63%)	21 (17%)	57 (46%)	48 (62%)	35 (46%)	13 (17%)
		No	45 (37%)	24 (20%)	21 (17%)	29 (38%)	20 (26%)	9 (12%)
4	Currently have patient/clinical information on smartphone	Yes	62 (50%)	13 (10%)	49 (40%)	29 (38%)	22 (29%)	7 (9%)
		No	61 (50%)	32 (26%)	29 (24%)	48 (62%)	33 (43%)	15 (19%)
5	Multiple devices streaming between each other	Yes	36 (29%)	12 (10%)	24 (20%)	22 (29%)	15 (19%)	7 (9%)
		No	87 (71%)	33 (27%)	54 (44%)	55 (71%)	40 (52%)	15 (19%)
6	Devices streaming to the cloud	Yes	61 (50%)	21 (17%)	40 (33%)	30 (39%)	21 (27%)	9 (12%)
		No	62 (50%)	24 (20%)	38 (31%)	47 (61%)	34 (44%)	13 (17%)

**Table 4: Level of perceived risk associated with smartphone and mobile technology use.**

			Republic of Ireland			United Kingdom		
			Total	Public	Private	Total	Public	Private
1	Risk awareness	Yes	94 (76%)	38 (31%)	56 (46%)	67 (87%)	47 (61%)	20 (26%)
		No	29 (24%)	7 (6%)	22 (18%)	10 (13%)	8 (10%)	2 (3%)
2	Skilled in digital professionalism	Yes	66 (54%)	25 (20%)	41 (33%)	50 (65%)	34 (44%)	16 (21%)
		No	57 (46%)	20 (16%)	37 (30%)	27 (35%)	21 (27%)	6 (8%)
3	Awareness of IT support available	Yes	25 (20%)	7 (6%)	18 (15%)	23 (30%)	13 (17%)	10 (13%)
		No	98 (80%)	38 (31%)	60 (49%)	54 (70%)	42 (55%)	12 (16%)
4	Would value IT support	Yes	114 (93%)	42 (34%)	72 (59%)	74 (96%)	53 (69%)	21 (27%)
		No	9 (7%)	3 (2%)	6 (5%)	3 (4%)	2 (3%)	1 (1%)

possess an appropriate level of technological skill to use a smartphone were in the private sector. Only six UK respondents felt that they did not have the technological skills to use a smartphone, with one of these being in the private sector.

- **Usefulness:** The majority of ROI respondents (n=95; 77%) confirmed that they found their smartphones useful for the meaningful exchange of clinical information (UK n=70; 91%) and this occurred in both public and private sectors.
- **Sending images by messaging:** Of the ROI respondents, the majority (n=78; 63%) confirmed that they use or have used their smartphones to communicate images, via WhatsApp or standard picture messaging, with a similar pattern observed in the UK (n=48; 62%). Of the ROI respondents who confirmed sending images, the majority were from the private sector.
- **Patient/clinical information stored on their smartphone:** Half of ROI respondents confirmed that they had or might have clinical information currently stored on their BYOD smartphones and, of these, the majority worked in the private sector. UK respondents who had patient/clinical information stored on their smartphone were mostly public sector.
- **Multiple streaming devices:** The majority of ROI respondents (n=90; 73%) confirmed that they own multiple smart devices and, of these, almost one-third (n=36; 29%) confirmed that data does (or has the potential to) stream between these devices, with respondents in both the public and private sectors, a finding also seen in the UK.
- **Streaming to the cloud:** Half of ROI respondents confirmed that their devices did (or had the potential to) stream sensitive patient data to the cloud, an activity that was observed in both the public and private sectors, with similar results seen among UK responses.

**Level of perceived risk associated with smartphone and mobile technology use**

Respondents were asked to answer questions in the following domains (Table 4):

- **Risk awareness:** The majority of the respondents from the ROI (n=94; 76%) considered themselves aware of the risks associated with the use of smartphones and smart devices for the communication of work-related data; respondents were in both the public and private sector, with a similar UK trend (n=67; 87%).
- **Skilled in digital professionalism:** Approximately half of ROI dental professionals believed themselves to be skilled in digital professionalism (n=66; 54%); respondents were in both public and private sector, with a similar UK trend (n=50; 65%).
- **Awareness of need for IT support:** The majority of ROI respondents (n=98; 80%) were unaware of any IT supports for wiping or ‘cleaning’ BYODs at the point of trading in, trading up or abandoning devices. A similarly high percentage of UK respondents reported a lack of awareness of such IT support (n=54; 70%).
- **Value of IT support:** Respondents in the ROI (n=114; 92.6%) agreed that IT support when trading in devices would be useful (UK, n=74; 96%). The highest levels of value for such IT support were observed in the ROI private and UK public sectors.

**Discussion**

This study used an online questionnaire distributed to a convenient sample of dental care professionals in the ROI and UK, and demonstrates that smartphone and mobile technology use is widespread. No attempt was made to match the

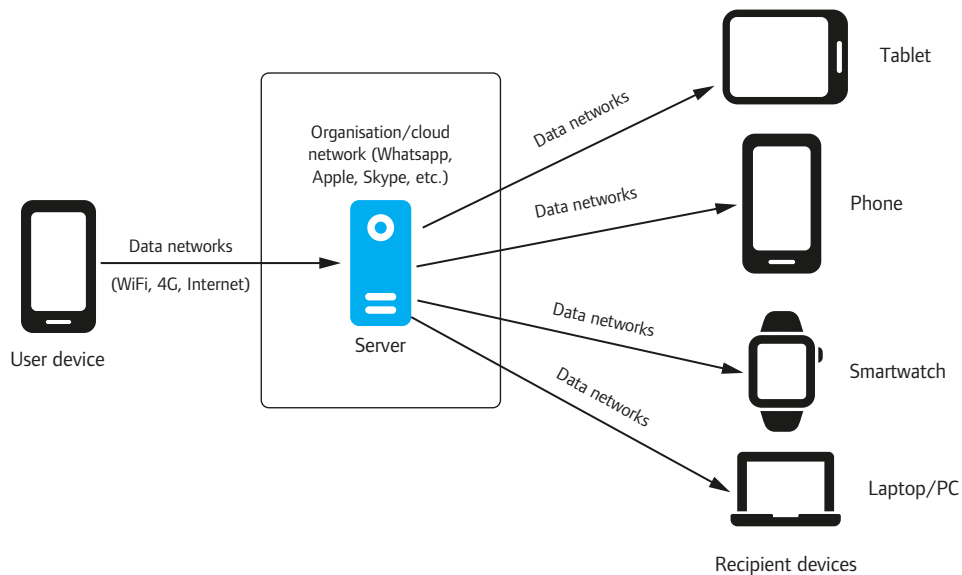


FIGURE 1: Illustration of data streaming between networked devices via the cloud.

demographics of ROI respondents with those of the UK; rather, the data was collated for trend comparison. Respondents confirmed that their smart devices are useful for the meaningful exchange of clinical information to assist patient management. However, while dental professionals may allow the exchange with a positive intention, the results confirm the use of inappropriate and insecure messaging apps<sup>7</sup> and video conferencing channels (e.g., WhatsApp and Zoom)<sup>8</sup> for the communication of sensitive patient data. Dental professionals currently practising within the EU (and UK) are obliged to work within the requirements of the GDPR. A minority of clinicians use SMS to communicate patient clinical information, contravening their GDPR obligations.<sup>7</sup> Accepting the limitations of the study, clinicians are mainly unaware of the potential for sensitive data to be obtained and exploited,<sup>2</sup> and yet clinicians ignoring GDPR may threaten patient confidentiality and bring the profession into disrepute. For the avoidance of doubt, the use of instant messaging and commercial Apps such as WhatsApp for clinical communications is insecure and not GDPR compliant.<sup>7</sup>

With regard to level of perceived risk, a large majority of dental professionals in the ROI confirmed that they had the appropriate level of technological skill to use a smartphone. Given the number of respondents confirming the streaming and storage of confidential patient data to additional networked devices (laptops, smartwatches, iPads, etc.), this confidence seems misplaced. This study raises information governance concerns regarding the potential for numerous insecure locations where sensitive patient data is being stored and points to an unmet need for further clinician training in this area.

A larger proportion of ROI dental professionals who practise privately responded to the questionnaire than in the UK sample, and report sending clinical images insecurely and storing patient information on insecure devices in concerning numbers. This may be a consequence of a lack of access to enterprise/institutional technology supports that might be available in the public sector (e.g., the HSE) and also suggests a requirement for private sector training. Only half of the ROI cohort were confident to confirm that their BYODs were not streaming work-related data to their associated non-institutional clouds, further highlighting the potential for sensitive patient data breaches. It appears to be poorly understood that the likes of the Apple iCloud are hosted in unregulated

servers outside the European Economic Area (EEA), and therefore are not GDPR compliant. **Figure 1** illustrates the potential for smart devices to stream data between networked devices via potentially non-GDPR-compliant and insecure cloud servers, an issue that is poorly acknowledged in the literature.<sup>3</sup>

The professional, ethical, security and legal concerns posed by popular messaging apps are established.<sup>2,7,9</sup> However, the wider functionalities associated with these modalities, including the selection of secure channels to communicate patient data, the data security issues posed by information streaming between networked devices, the streaming of sensitive patient data to insecure cloud servers, and the cleaning of devices before they are abandoned, traded in, or traded up, provide further areas for concern. Poor awareness regarding phone stewardship (protecting and being responsible for the data held on a mobile phone)<sup>10</sup> also evidences a requirement for digital professionalism and technical training for even the most experienced dental professionals. Despite lack of insight with regard to data security, there is a high level of recognition among professionals that supports the requirement for tasks such as wiping devices of patient-identifying data in the public and private sectors.

### Conclusions

App, smartphone, and mobile device ownership among dental professionals for clinical communications is widespread in the ROI (and UK), with this study demonstrating that dental professionals are using their devices to send images (photos and radiographs) to one another. The risks associated with these activities are only partly acknowledged, with many dental professionals evidencing a lack of insight into data security. Dental professionals may benefit from mobile device management software to remove data when required, online portals to securely store and manage clinical images, and digital professionalism training. Some of these solutions are emerging in the UK's National Health Service (NHS), and could be included as part of professionalism and ethics training provided to clinicians through their indemnity organisation, which has flagged concerns in professional publications.<sup>11</sup>

We conclude that there is an unmet need for technical solutions, technical support, and digital professionalism training to facilitate the appropriate use of

smartphone technology for dental clinicians practising in the ROI. Until these supports are in place, it is essential for dental professionals to engage in the use of smartphone and mobile technology for the dissemination of clinical data with caution as they try to best serve their patients.

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## CPD questions

To claim CPD points, go to the MEMBERS' SECTION of [www.dentist.ie](http://www.dentist.ie) and answer the following questions:

1. What is the name of the EU regulation that was implemented across the EU in 2018 concerning data protection and privacy?.

- Copyright and Patient Privacy Directive (CPPD)
- General Data Protection Regulation (GDPR)
- Privacy and Data Processing Regulation (PDPD)
- General Data Privacy Rule (GDPR)

2. The majority of dental professionals stated that they had the clinical skills to use a smartphone to communicate patient data:

- and on further questioning they demonstrated that they knew how to keep patient data secure.
- thus confirming that they require no further training, support or policy regarding the issue of data privacy.
- so patients should rest assured that their privacy is protected when sharing private information with dental professionals
- yet they agreed in large numbers that they currently had patient information stored on their smartphones and streaming to their associated clouds.

3. Digital professionalism was outlined as an area of required competence for graduating dentists in Europe in 2017 under the domain of professionalism. This concerns:

- the use of workplace technology to improve patient care
- the protection of patient data through the appropriate use of digital communications and was explicitly highlighted in an effort to avoid damage to the wider profession by bringing it into disrepute, undermining the trust that the public hold in dental professionals
- undergraduate training only and is not an issue for clinicians who have been in practice for a number of years
- the GDPR and concerns awareness for newly graduating clinicians so that they work within practice guidelines

