Refereed papers

Computer literacy, skills and knowledge among dentists and dental care professionals (DCPs) within primary care in Scotland

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ABSTRACT

Objective To gain a better understanding of the level of literacy in information technology (IT) across the dental team working within primary care in Scotland, thus allowing appropriate planning of education and training for effective use of IT.

Design A postal questionnaire survey of all dentists and dental care professionals (DCPs) within primary care in Scotland; online reply was also an option.

Setting General dental practice and the salaried dental service, May 2004.

Subjects and methods 2679 dentists and 2861 DCPs were surveyed.

Results Forty-three percent of respondents considered their IT skills to be 'moderate', with a further one-third reporting 'nil' or 'low' skill level. Only a quarter of respondents had accessed a learning programme by computer. The majority of IT competence was self-acquired.

Conclusions 'Upskilling' the dental team in IT may be required in order to take advantage of e-learning opportunities available now and in the future.

Keywords: dental care professionals, dentistry, ICT

Introduction

The use of computers in dental education and practice dates back to the mid 1960s, when they were used in dental schools and large practices for specific (and limited) administrative tasks. However, the role of and emphasis on the computer have changed considerably over the last few decades, and computers are now becoming an integral part of dental education and dental practice.[1]

Information and communication technology (ICT) is currently used in many areas of oral health care, including electronic databases, data transfer and practice management.[2] Appropriate ICT tools (such as email, online databases, internet and computer-assisted learning) may be utilised by staff, not only for personal and professional development, but also for the benefit of patients.[3] There is a national agenda for the development of ICT within health care[4] and firm warnings have been issued about the dangers of 'being left behind'.[5]

In the future, as a consequence of developing technologies and widespread availability of computers within dentistry, the efficient functioning of the dentist and dental team will be dependent on adequate computer literacy. Much effort is currently being put into the development of e-learning packages. Such packages will require the end user to be competent in ICT.

As the potential and advantages of ICT increase, it is crucial that all staff have sufficient skills and knowledge in order to maximise full benefits from computers and associated technologies.[6] These benefits should be both administrative and educational.

The modern dental team is made up of dental surgeons and dental care professionals (DCPs), including hygienists, dental nurses, dental therapists and technicians.

Objective

To obtain baseline data on the level of computer skills and knowledge, and the ability to access IT by respondents across the dental team in Scotland. These data would be used to inform the dental educational and training strategy of National Health Service (NHS) Education for Scotland.

Design

A questionnaire was designed and piloted across the various representative groups of dental professionals in Scotland. Minor modifications were made as a result of feedback and the final version of the questionnaire is shown in Figure 1.

Setting

The questionnaire was sent by post in May 2004 to all dentists and DCPs working within primary care in Scotland.

Subjects and methods

The questionnaire was sent out to all dentists in the general dental service (n=2418), community dental service (n=261) and dental care professionals (n=2861) in Scotland. Contact addresses were obtained from databases held by NHS Education for Scotland. The questionnaire was sent as an individual mailshot and was not added to any other official or unofficial mailing.

In order to help make the survey more user-friendly and straightforward to complete, the questionnaire could also be accessed online via the NHS Education for Scotland dentistry webpage, and submitted electronically. This provided an alternative to completing a paper copy of the questionnaire for those with access to a computer. A covering letter provided access and password details for online submission. Participants were asked to submit their responses by mail *or* online and not in both forms. Due to the anonymity of responses, the study did not specifically monitor for dual submission, leaving this to the professional integrity of participants.

Results

A total of 157 forms were returned by post because of incorrect mailing addresses, resulting in a final sample size of 5384. A total of 2568 questionnaires were completed (and either returned electronically or by post), resulting in a final response rate overall of 48%. The response rate for dentists was 50%.

The questionnaire sought responses from the surveyed groups in the following areas.

Professional group

Over half (52%) of all survey respondents were dentists, followed by dental nurses (33%) and hygienists (8%). The 'other' category referred to in the tables and figures includes practice managers and administrative staff.

Gender

Two-thirds (65%) of respondents were female and 35% were male.

Age group

Of those staff who completed the questionnaire, 31% were in the 31–40 age band, closely followed by 30% in the 41–50 age band.

Figure 1 Questionnaire

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**NHS Education for Scotland
Computer Usage Survey**

NHS SCOTLAND

13. **Assessment of your IT skills**

**Shade ONE circle only
for each skill**

Q1

	None	Basic	Intermediate	Advanced	
a) Understanding of basic terms (e.g. mouse, save to disk)	○	○	○	○	
	School	Dental School or College	At Work	Self Taught	Courses
b) How was this skill acquired?	○	○	○	○	○

Q2

	None	Basic	Intermediate	Advanced	
a) Word processing, and typing	○	○	○	○	
	School	Dental School or College	At Work	Self Taught	Courses
b) How was this skill acquired?	○	○	○	○	○

Q3

	None	Basic	Intermediate	Advanced	
a) Spreadsheets	○	○	○	○	
	School	Dental School or College	At Work	Self Taught	Courses
b) How was this skill acquired?	○	○	○	○	○

Q4

	None	Basic	Intermediate	Advanced	
a) Graphics - presentation packages (e.g. Power point)	○	○	○	○	
	School	Dental School or College	At Work	Self Taught	Courses
b) How was this skill acquired?	○	○	○	○	○

Q5

	None	Basic	Intermediate	Advanced	
a) Email	○	○	○	○	
	School	Dental School or College	At Work	Self Taught	Courses
b) How was this skill acquired?	○	○	○	○	○

Q6

	None	Basic	Intermediate	Advanced	
a) World Wide Web - searching skills	○	○	○	○	
	School	Dental School or College	At Work	Self Taught	Courses
b) How was this skill acquired?	○	○	○	○	○

Q7

	None	Basic	Intermediate	Advanced	
a) Use of Electronic library (e.g. on-line catalogues, e-journals)	○	○	○	○	
	School	Dental School or College	At Work	Self Taught	Courses
b) How was this skill acquired?	○	○	○	○	○

Q8

	None	Basic	Intermediate	Advanced	
a) Use of File Management - eg. save, delete, copy, merge, find	○	○	○	○	
	School	Dental School or College	At Work	Self Taught	Courses
b) How was this skill acquired?	○	○	○	○	○

Q9

	None	Basic	Intermediate	Advanced	
a) Use of a scanner	○	○	○	○	
	School	Dental School or College	At Work	Self Taught	Courses
b) How was this skill acquired?	○	○	○	○	○

*Many thanks for taking the time to complete this questionnaire.
Please return it in the pre-paid envelope provided or submit on-line by 1st May 2004.*

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Figure 1 Continued

Table 1 Main place of work, by staff group

	Dental practice	Community clinic	Hospital	Total
Dentist	1051	113	13	1177
Dental nurse	531	162	71	764
Hygienist	153	23	8	184
Therapist	4	9	3	16
Technician	18	3	22	43
Other*	53	9	3	65
Total	1810	319	120	2249

* The 'other' category in this table, and subsequent tables and figures, includes practice managers and administrative staff.

Number of years since qualification

Nearly one-third (31%) of respondents had qualified between 11 and 15 years ago, whilst 15% had qualified within the last five years. Six percent of staff (n=152) had qualified more than 36 years ago, and 15% of respondents were unqualified at the time.

Main place of work

The majority of staff (80%) indicated that the dental practice is their main place of work, followed by community clinics (14%), or within a hospital setting (5%). This information was missing in 294 cases. Table 1 shows the number of staff working in each setting.

Computer access for personal professional activity

Nearly two-thirds (65%) of staff reported having access to a computer at work for personal professional activity (see Table 2). Thirty-six percent of staff had access both at work and home. Although 35% did not have access at work, this figure falls to 14% who did not have access to a computer at home. Eleven percent of staff (n=278) did not have access to a computer both at work and home.

Internet access

Forty-one percent of staff (n=1041) reported having access to the internet at work, of which 223 (21%) use broadband. However, the majority of staff (84%) had internet access at home (with 27% using broadband). Thirty-six percent of staff (n=884) had access to the internet both at home and work, whilst 11% did not have internet access at all. With regard to the 41% of staff who were able to access the internet at work, the majority of this group were either dentists (53%) or dental nurses (32%).

Table 2 Number (%) of staff who have access/no access to a computer at work

Profession	Access to a computer for personal professional activity at work	
	Yes n (%)	No n (%)
Dentist	858 (66)	446 (34)
Dental nurse	532 (65)	289 (35)
Hygienist	122 (60)	81 (40)
Therapist	8 (50)	8 (50)
Technician	37 (58)	27 (42)
Other	67 (84)	13 (16)
Total	1624 (65)	864 (35)

Perception of computer competence

All staff groups

Figure 2 shows the number of responses between professions for each of the categories of computer competence (n=2523).
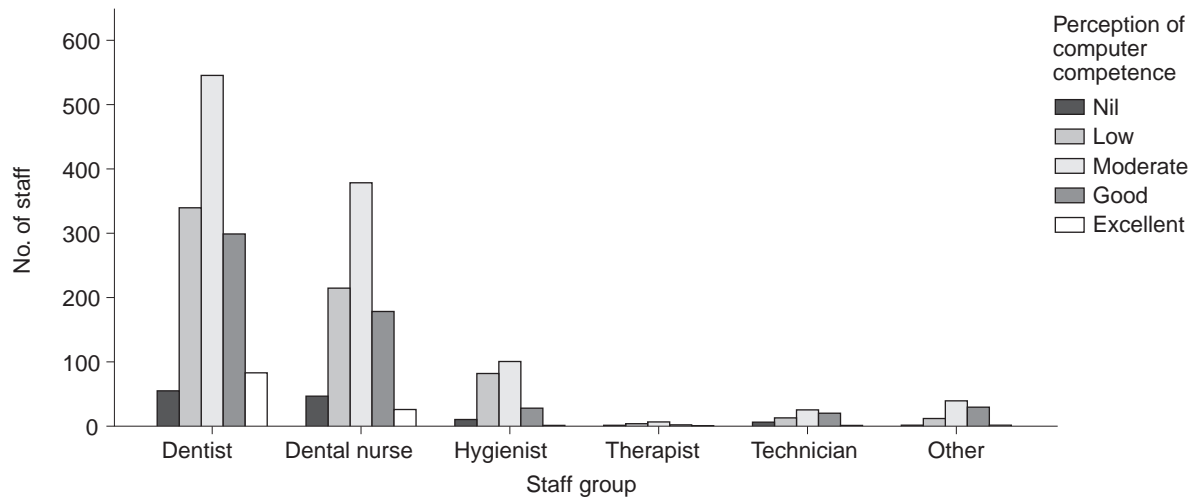
Figure 2 Perception of computer competence, by staff group

Forty-three percent of staff selected the 'moderate' category as representing their level of computer competence. Almost one-third of staff (n=772) self-reported their level of computer competence as either 'nil' or 'low' – over half this group were dentists (51%) and dental nurses (33%). Overall, only 4% of staff chose to select the category of 'excellent' computer competence, the majority being dentists (72%).

Possessing no (or low) levels of computer competence varies widely between staff groups. This category was selected by 40–41% of hygienists/therapists, 30–31% of dentists/dental nurses and 26% of technicians. However, the 'moderate' category was chosen by 47% of therapists, 46% of hygienists, 45% of dental nurses, 41% of dentists and 35% of technicians. The option of selecting the 'excellent' level of computer competence was only chosen by 6% of dentists, and 3% of both dental nurses and technicians.

Dentists

Looking specifically at computer competence in relation to dentists, 31% of those who had qualified between 16 and 25 years ago perceived themselves to have 'good' or 'excellent' competence. Approximately one-quarter (26%) of dentists who had qualified between 11 and 15 years ago also felt they had good or excellent computer competences. This is illustrated in Figure 3. Given that Figure 3 relates to dentists and their years since qualification, it is not evident why a number of respondents chose to select the 'unqualified' category of the questionnaire. This may suggest that some participants were under the impression that this referred to a formal ICT qualification, rather than a dental qualification.

Of those dentists who chose the nil competence category, 34% were from the 51–60 age group and 32% from the 41–50 age group. Only 4% of 21–30-year-old dentists (n=2) selected the 'nil' competence category.
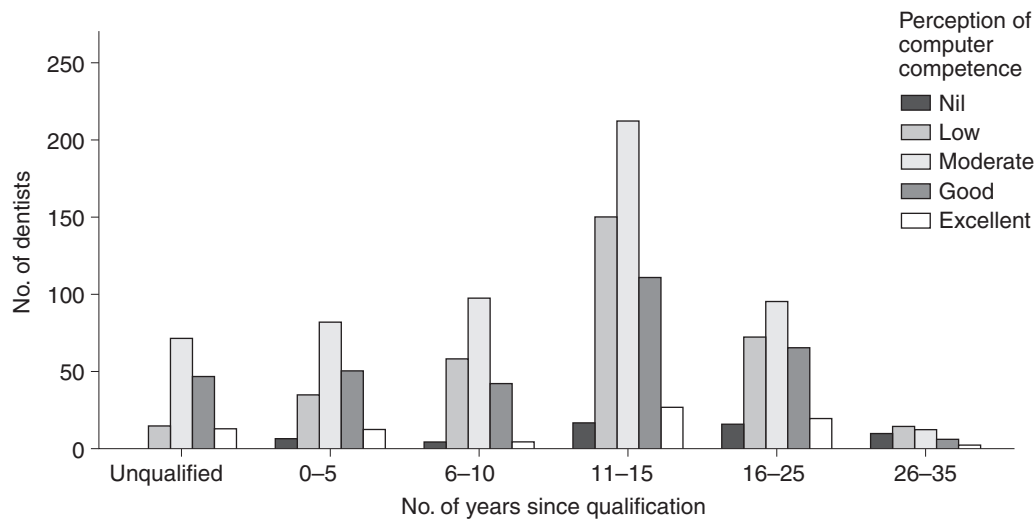

Figure 3 Dentists' perceptions of their computer competence levels, by number of years since qualification

Over one-third of male dentists (34%) felt they had excellent or good computer competence, compared to just 18% of female dentists (see Figure 4). However, only ten females (2%) considered themselves to have no competence, compared to 25 (4%) of male dentists.

Learning programmes

Learning programmes accessed via a computer have been used by one-quarter of staff (*n*=642). Of those who reported using these, 535 (85%) have accessed between one and five, 58 (9%) between six and ten, whilst only 38 staff (2%) have used more than 11 learning programmes (see Figure 5).

Table 3 shows the extent of access to learning programmes between the different members of the dental team.

Of those staff who reported accessing at least 11 learning programmes, 90% were dentists. The remaining 10% consisted of two dental nurses, one hygienist and one dental technician.

Interestingly, it appears that males are more inclined to have accessed a greater number of learning programmes compared with their female colleagues.

There is a fairly equal split between gender on using between one and five learning programmes (48% of men and 52% of women). However, men account for 78% of those who accessed between six and ten learning programmes, and 67% of those who used more than 11 learning programmes.

E-library

Most of the staff (86%) had not accessed NHS Scotland's e-library, whilst only 236 (9%) reported accessing this facility. Five percent of respondents did not understand what this term meant (*n*=134). The majority of staff who reported accessing this facility were dentists (67%) and dental nurses (20%). Of those staff who did not understand the term 'e-library', 49% were dentists, 36% dental nurses and 11% hygienists.

Personal digital assistant

Six percent of staff reported using a handheld personal digital assistant (PDA). This group of 148 staff using a
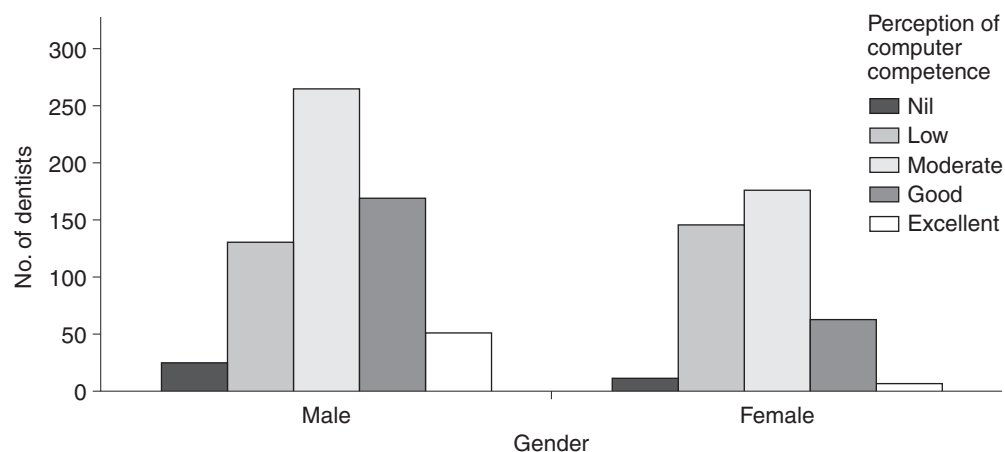

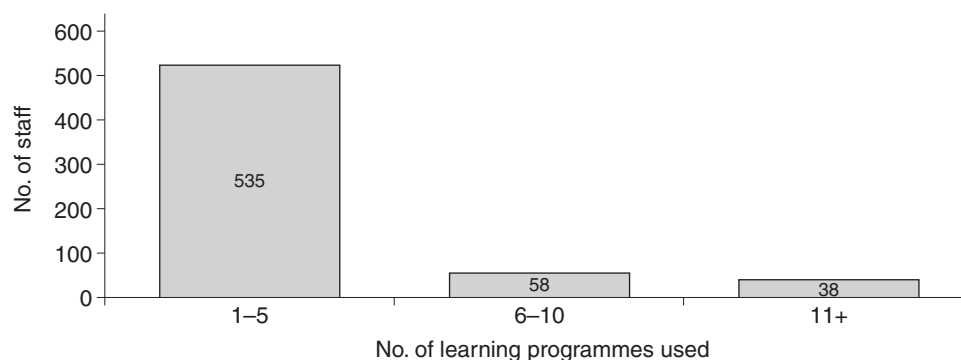**Figure 4** Dentists' perceptions of computer competence, by gender

Figure 5 Number of learning programmes accessed via a computer

Table 3 Number (percentage) of learning programmes, by staff group

Profession	No. of learning programmes accessed via a computer		
	1–5 n (%)	6–10 n (%)	11 or more n (%)
Dentist	367 (81)	51 (11)	34 (8)
Dental nurse	115 (95)	4 (3)	2 (2)
Hygienist	16 (80)	3 (15)	1 (5)
Therapist	5 (100)	–	–
Technician	14 (93)	–	1 (7)
Other	12 (100)	–	–
Total	529 (85)	58 (9)	38 (6)

PDA consisted of 123 dentists (83%), 15 dental nurses (10%), four hygienists (3%) and three therapists (2%). Figure 6 shows the number of staff within each profession, either using or not using a PDA.

Analysis by gender indicates that men are more likely to use a PDA compared with women. Of those staff who indicated that they use a PDA, 64% are male and 36% are female. A handheld computer is most likely to have been used by staff in the 41–50 age group (38%), followed by the 31–40 age group (28%). Only 13% of staff who reported using a PDA were from the 21–30 age group.

Amount of time spent using a computer

Staff were asked how many hours per week (on average) they used a computer on work-related issues. There was a very good response to this question (n=2554, 99.5%), with only 13 missing answers. The median length of time spent on a computer on work-related issues is three hours per week (the mean is nine hours).

The amount of time spent on a computer during the week varied greatly, from zero to 85 hours per week. Nearly one-quarter of respondents (23%) spent no time at all on a computer for work-related issues. Fifteen percent used a computer for one hour per week, 11% for two hours, 6% for ten hours and 4% for 20 hours per week.

The variation in the length of time spent on a computer per week ranged from nearly 1000 staff spending either zero or one hour on a computer, to one male general dental practitioner (GDP) spending 85 hours per week using a computer for work-related purposes. There were 12 members of staff who spent at least 50 hours per week on a computer (11 dentists and one dental nurse), with a range of 50–85 hours.
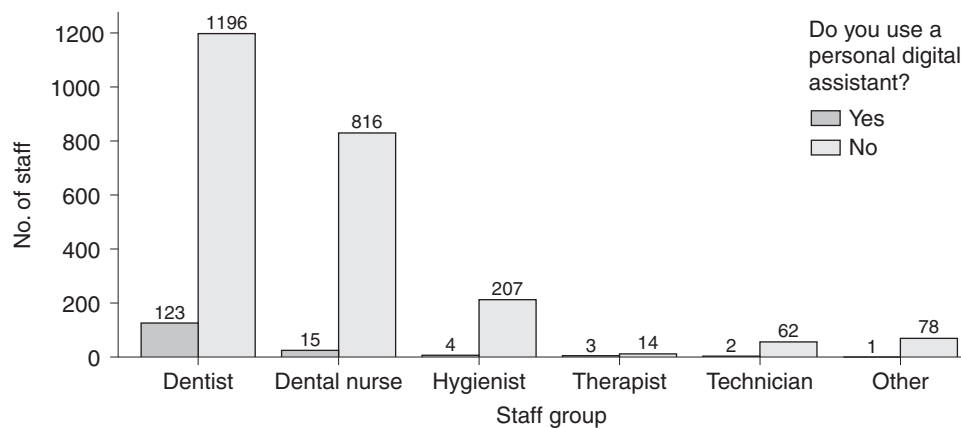
Figure 6 Use of a handheld computer (PDA), by staff group

Self-assessment of IT skills

In this section of the questionnaire, respondents were asked to rate their own perceived skill level ('none', 'basic', 'intermediate' or 'advanced') across a variety of IT skills. An additional part of this question examined how each skill was acquired (at school, dental school/college, at work, self-taught or by attending a course). Each specific IT skill is examined below in more detail.

Understanding of basic IT terms (e.g. 'mouse', 'save to disk')

Thirty-nine percent of respondents (n=982) reported having basic skills in understanding IT terminology. This was followed by 36% assessing themselves at an 'intermediate' level, and 22% at an 'advanced' level. Figure 7 shows the number of staff within each skill level. Of those who rated themselves as 'advanced' in this skill, 65% were dentists (n=361) and 24% dental nurses (n=135).

This particular skill was self-taught in most cases (62%), acquired at work (13%), learned on a course (11%) or learned at school (10%). Only 4% of staff learned basic IT terminology at dental school or college.

Word processing and typing

Forty-five percent of staff (n=1146) reported having basic word-processing and typing skills, followed by 36% at an intermediate level. Ten percent rated themselves as 'advanced', whilst a further 10% believed they had no word-processing skills. The staff who rated themselves as having no word-processing and typing

skills mainly consisted of dentists (n=124), although there were also 114 dentists who had 'advanced' word-processing skills. No therapists selected the advanced option, although 6% of hygienists and technicians perceived themselves to be at this skill level. Of those staff who selected the advanced option for word processing and typing, 30% were male and 70% female.

This particular skill was self-taught in over half of the cases (57%), whilst 20% learned word-processing skills at school. Ten percent acquired this skill by attending a course, 8% at work and 5% at dental school/college.

Spreadsheets

The option of 'no spreadsheet skills' was selected by 46% of survey respondents (72% female and 28% male). Thirty-eight percent rated themselves to have basic skills, whilst 13% chose the intermediate option. Only 70 people (3%) chose the 'advanced' skill rating, and two-thirds of this group were dentists (n=45). No hygienists or therapists selected the advanced skill option.

Fifty-two percent of respondents were self-taught in spreadsheet skills, compared to 18% who attended a course and 14% who learned this skill at school. Nine percent acquired spreadsheet skills in the workplace and 7% at dental school/college. However, 1248 people failed to answer this particular question.

Graphics presentation packages

The majority of respondents (60%) felt they had no IT skills in this area. However, just over one-quarter (26%) perceived themselves to have basic skills in using graphics presentation packages. Eleven percent
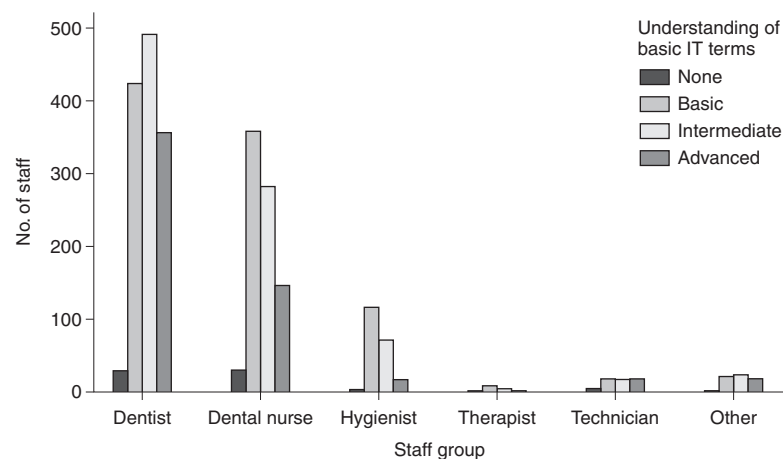

Figure 7 Self-assessment of understanding basic IT terminology, by staff group

chose the intermediate option, whilst 3% considered themselves to have advanced skills in this area. For those who selected the 'advanced' skill option, 66% were dentists (n=53).

This particular skill was self-taught in 56% of cases, whilst 20% of respondents attended a specific course. Ten percent acquired this skill at dental school/college, 8% at work and 7% at school. Over 1500 staff did not answer this particular question.

Email

The 'basic' skill option was selected by 40% of respondents, followed by 'intermediate' (36%) and 'none' (14%). Only 11% reported having advanced email skills – 184 dentists (68%) and 54 dental nurses (20%). Of those staff who reported having 'no' email skills, 53% were dental nurses.

It was mainly dentists that selected the 'advanced' skill level option (68%). For those that reported having no email skills, the majority were female (80%). However, this proportion was even at the 'advanced' skill level (51% male, 49% female).

This particular skill was self-taught in the majority of cases (84%). Six percent of respondents learned email skills at work, 5% on a course and 4% at dental school/college. Only 18 (0.8%) learned email skills at school.

World Wide Web

Thirteen percent of respondents reported having no web searching skills (17% of males, compared to 82% of females). Thirty-eight percent considered themselves to have basic skills in this area, whilst a similar percentage (37%) rated themselves at an intermediate level. Eleven percent of staff rated themselves as 'advanced' at searching on the World Wide Web, with a fairly even split between gender (52% male and 48% female).

Searching on the World Wide Web was self-taught in the majority of cases (89%). However, 5% acquired this skill on a course, 3% learned the necessary skills at work, 3% at dental school/college and 1% at school.

Use of e-library

Approximately 1100 (43%) respondents had never used an e-library, for example to access online catalogues or e-journals. Over one-third (34%) of staff reported having basic skills and 19% intermediate skills. Only 4% considered themselves to be advanced in the use of an e-library, and the majority of this group consisted of dentists (74%). Of those who reported

having no e-library skills, three-quarters were female staff (n=671).

Again, this particular skill was self-taught in the majority of cases (81%). Nine percent learned how to use an e-library at dental school/college, 5% at work, 4% on courses and 1% at school. However, this question was unanswered by 1153 staff.

File management

One-quarter of staff (24%) perceived they had no file management skills (for example, 'save', 'delete', 'copy', 'merge', 'find'). This group consisted of 72% females and 28% males. However, 43% thought they had a 'basic' skill level and 24% had 'intermediate' level. Of the 8% of staff who considered themselves to have advanced file management skills, nearly three-quarters were dentists (n=147). In those choosing the 'advanced' skill level, there is a more even gender split (58% males and 42% female).

Two-thirds of respondents (66%) taught themselves this skill, whilst 12% learned file management on a course, 10% at work, 7% at school and 5% at dental school/college.

Use of a scanner

Forty-six percent of respondents had never used a scanner, although 33% reported having basic skills and 17% intermediate skills. Just over 100 staff (4%) considered themselves to have advanced skills in using a scanner, and three-quarters of this group were dentists.

Three-quarters of staff who had never used a scanner before were female (n=710). At an 'intermediate' level, the proportion between the sexes is somewhat more even, consisting of 58% males and 42% females. The 'advanced' skill level for using a scanner consisted of 49 men (66%) and only 25 women (33%).

For those who did use a scanner, this skill was self-taught in 84% of cases. Eleven percent learned how to use a scanner at work, 2% at dental school/college, 1% at school and 1% on a course.

Perceived lack of IT skills

With regard to having an understanding of basic IT skills, it appears that only a minority of staff feel they have no skills at all in this area (n=88). However, nearly half of all staff assessed themselves as having no spreadsheet skills or the ability to use a scanner. A quarter of staff felt they had no file management skills.

Table 4 shows the number (and percentage) of staff who rated themselves as having 'no skills' in the various IT areas.

Table 4 Staff who rated themselves as having 'no IT skills'

	Perceived level of skill = none[*] n (%)
Understanding of basic IT terms	88 (4)
Word processing & typing	246 (10)
Spreadsheets	1179 (46)
Graphics	1538 (60)
Email	352 (14)
WWW – searching skills	337 (13)
Use of e-library	1102 (43)
File management	618 (24)
Use of scanner	1174 (46)

*Note: percentages are based on total number of responses for each question – which may vary across skills.

Conclusions

Information technology is growing rapidly in both its capability and capacity to support the delivery of health care. The aim of this study was to provide baseline information on the level and knowledge of skills across the dental team in primary care within Scotland. Previous studies have looked at the availability of computer hardware and the uptake of computer-assisted learning within the United Kingdom (UK) and elsewhere, but predominantly by dentists.[7–10] This study has looked at the literacy level, skills and knowledge within ICT in primary care dentistry across the entire dental team and throughout Scotland.

Given that the percentage response rate was lower than ideal at 48%, any conclusions from this study should be taken with some caution. However, the overall number of participants was high at 2568 and so this sample is likely to be representative of IT competency and availability across Scotland and,

perhaps, in the UK in general. As such, its findings may have some impact on the planning and development of e-learning across the dental team in the UK. The majority of members of the dental team have 'self-taught' computer skills. It is clear that resources are required to 'upskill' the dental team in IT to allow full access to current and planned e-learning packages. Perhaps we are not as far forward as we think?

The need for education and training in ICT has been identified similarly in other healthcare professions, at various stages of development. In one UK study, 44% of hospital doctors identified no skills in database software and saw this as a training need.[11] Another UK study found that computer skills among one group of trainee doctors was 'low',[12] and in a group of UK nursing staff, infrequent use of IT provision was evident, despite their having a 'positive attitude' to IT.[13] One study among Australian general medical practitioners has shown that older GPs (>55 years) have found greater change in their skills after training than their younger colleagues.[14] Education and training should therefore be employed across the dental team, regardless of age.

There is clearly a training and education need for various aspects of ICT within the dental team, not simply at undergraduate level but throughout the life-long continuing professional development of each member of the dental team. It is an important finding of this study that most ICT skills are self-taught and yet are in daily use within the professional environment. Is it time for a national strategy in ICT education and training for all members of the dental team as part of continuing professional development?

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CONFLICTS OF INTEREST

None.

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