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THE PHARMACIST AND COMPUTER SKILLS TOWARDS E-HEALTH. RESULTS OF A SURVEY AMONG ITALIAN PHARMACISTS

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ABSTRACT

Background: Health practitioners of different disciplines (physicians, paramedic personnel, pharmacists) should possess adequate ICT (Information and Communication Technology) skills and practical competence on these technologies. Pharmacy practice requires a relevant flow of information, collection and handling of which could be facilitated by ICT. The correct use of ICT requires a proper knowledge by professionals offering a public service. The purpose of this paper was to assess basic informatics background and computer uses in pharmacists practicing in Italy, with the aim to identify educational interventions for increasing their informatics abilities.

Methods: A questionnaire was proposed to pharmacists working in Italian community pharmacies. The survey was articulated into 35 questions concerning computer basic knowledge, ICT facilities, computer skills, habits, and uses in pharmacy practice.

Results: The questionnaire was completed by ~45% (No. 224) of responders, the 96.9% of which used computer. Only 7.8% of interviewed people employed e-mail to communicate with health authorities and less than 2% used it to be in contact with physicians or other health professionals. Less than 40% used ICT for training courses. The results revealed a relevant percentage (90.8%) of self-learners to computer use, while only 9.2% was trained by specific courses.

Conclusion: Basic knowledge of community pharmacists on ICT technological infrastructure is quite low. Although pharmacists play an essential role in health services, they have apparently limited computer skills. This suggests the need of educational and training efforts for enlarging computer and ICT resources competent use in daily pharmacy practice.

Key words: Pharmacists, Public Health, Professional development, Computer skills, Education.

Running title: Italian pharmacists: computer skills to e-health

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Introduction

Informatics, and more in general information and communication technologies (ICT), are becoming pillars of health activities. National Health Services encourage the development and use of ICT for improving the quality of services for citizens possibly at reduced costs[1-5]. Relevant ongoing European experiences in the field are those of United Kingdom (National Strategic Programme for 21st century), and of Italy (e-Gov 2010 programme, and consecutive updating)[6-8]. Health practitioners (physicians, paramedic personnel, pharmacists) should possess adequate ICT skills and practical competence on these technologies.

Pharmacy practice requires a relevant flow of information, whose collection and handling may be facilitated by ICT. Pharmacy is a relevant user of ICT to support administrative and operative activities. Today, it is impossible to envision the pharmacy of future without reliance on informatics. It consists in the use and integration of data, information, knowledge, and technology which are involved in drug use processes[9-11]. This integration often improves outcomes and services. In general, on entering a pharmacy, the presence of a PC and its common use by pharmacists could be observed. A more advantageous use of ICT facilities/ technology requires a proper basic knowledge by professionals offering a public service. In view of this, it is desirable that adequate computer courses become part of university curricula to educate health professionals about computer science and ICT[11]. In the US, Pharmacy courses programs certified by the Accreditation Council for Pharmacy Education (ACPE) are required to meet ACPE's Standards and Guidelines for Curriculum[12]. Guidelines specifically state that pharmacy graduates must be able to "demonstrate expertise in informatics" [11,12].

The main studies on how pharmacists gained their computer skills and abilities include an investigation promoted by the Royal Pharmaceutical Society of Great Britain assessing the provision of Internet access and medical databases to community pharmacists working in London area and Essex[13]. More recent studies were conducted in Nigeria and India among health professionals, including pharmacists and revealed an overall good computing knowledge, mainly between doctors and nurses[14-16]. Another recent work was based on a survey of computer literacy skills profile of pharmacists in two counties of England, and the results showed that the majority of responding pharmacists used computers both at work and home, where confident in operating computer systems, but identified a training need for particular software applications[17]. Computer use habits and skills were also investigated in Canada and Greece[18,19]. In the first study[18] that involved Canadian hospital pharmacists, most pharmacists believed they needed to upgrade their computer skills. Medical database and Internet searching skills were identified as those more critical for improving practice effectiveness. The second study[19] was conducted between 92 community pharmacists who are increasingly utilizing information services in their everyday practice. Other surveys focused on different categories of health professionals including pharmacists

(Continued on page 52)

analyzed the use of PDAs (Personal Digital Assistants), and IBMI (Internet-Based Medicines Information)[20,21]. In the US pharmacy, informatics education is assessed analyzing accredited pharmacy programs[11].

In Italy data concerning this topic are sparse and limited to the analysis of computer literacy of physicians and nurses. In general, it could be affirmed that the level of ICT skills of health professionals is relatively low[22-26].

The present study was designed to evaluate, through a self-administered survey, basic computer skills and abilities of pharmacists working in Italian community pharmacies with the aim to identify the competencies in informatics education useful to the pharmacists for their own working activities.

In Italy there are 30 Schools of Pharmacy graduating approximately 3,000 professionals per year[27]. The analysis was performed in collaboration with Registries of Pharmacists operating in the Marche region.

Methods

An anonymous questionnaire to assess community pharmacists' computer knowledge and skills was designed. It was divided into six sections: a) Demographic data; b) Sources of computer basic knowledge; c) Availability of computer and ICT facilities; d) Computer skills; e) General computer use habits; f) Computer and ICT uses in pharmacy practice. The draft questionnaire was given to a sample of professionals (10 community pharmacists and 5 members of Pharmacists Board of Marche region) to assess the face validity, and participants were asked to fill-in the questionnaire noting any questions unclear or ambiguous, and to provide any suggestions for improvement (ease of completion, legibility, time to fill-in, etc.). The suggestions helped us to review the questionnaire and improve it[28,29].The final questionnaire was articulated into 35 questions. Survey organization included the distribution of 493 questionnaires, delivering one questionnaire per pharmacy.

The time required to fill the questionnaire was evaluated in simulations with the 5 Board Members of Registries of Pharmacists, and 10 community pharmacists involved in questionnaire validity. It was averaged approximately 45 min. In view of the required time and to avoid an excessive loss of time by people interviewed, questionnaire was left to one professional for the pharmacies employing more than one pharmacist. The questionnaire had to be filled-in only by selected professional, without possibility to be replaced. This to avoid that only some ages classes could answer (usually young people are more interested in this topic than older one). This was also one of the reasons why the responder was chosen by a computer-assisted programme starting from the list of people employed in each pharmacy (directors +professional pharmacists). The selected pharmacists did receive a letter with the questionnaire. The cover letter explained the rationale of the survey and provided instructions on how to return the completed questionnaire.

Questionnaire answers were received, collected and transferred in Microsoft Excel sheets. This software was

(Continued on page 53)

used for data storing and processing. Statistical analysis was performed by the X-Lstat software[30]. For analysis of the qualitative (gender) and quantitative (age) variables the chi-square test was used and statistical significance was established at $p<0.05$.

Results

a) Demographic data

The questionnaire was completed by 224 pharmacists (66. 5% female and 33.5% male), with a response rate of 45.4%. The mean age of the responders was 43.5±11.3 years (range: 25-76). This mean age is consistent with the average age of pharmacists operating in public pharmacies in Italy (data obtained from Italian Federation of Pharmacists Register). In terms of high school graduation of the Marches pharmacists, they mainly followed scientific courses. A small part of them attended humanistic courses. A number of pharmacists taking part to this survey was graduated in pharmacy (85.7 %), whereas 14.3% of them were graduated in Pharmaceutical Chemistry and Technology (Table 1). Although this last degree is designed for training researchers for Pharmaceutical industry, professionals with this degree can also work as pharmacist after one year of internship in a community pharmacy. The 65.6% of responders were graduated in the two universities of Marche region (Camerino and Urbino). The 98.7% of responders had one degree only, whereas the 1.3% of them had 2 degrees. The 9.4% of responders obtained a post-graduate qualification/specialization such as PhD, diplomas of herbalists, cosmetics, homeopathy or nutrition.

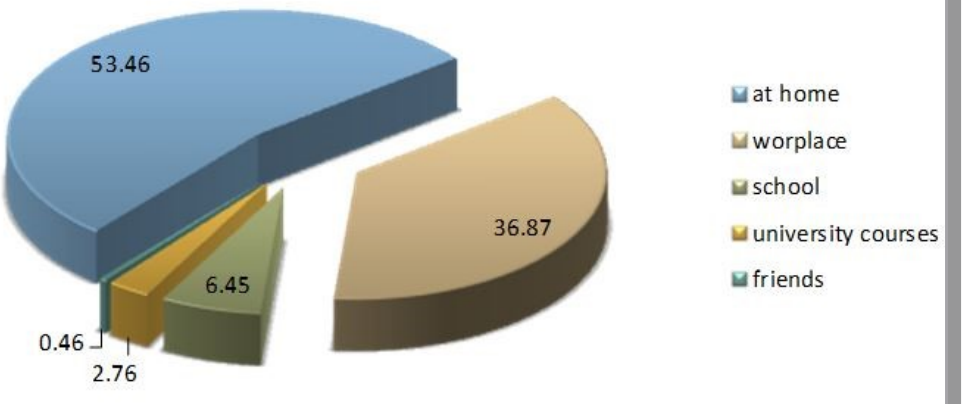
Table 1: Demographic data of the participants to the survey

	n.	%
Gender		
Male	75	33.5
Female	149	66.5
Total	224	100.0
Age classes		
< 30	23	10.3
30-39	72	32.1
40-49	55	24.6
50-59	56	25.0
60-69	16	7.1
≥ 70	2	0.9
Degree		
Pharmacy	192	85.7
CTF*	32	14.3

*(*Pharmaceutical Chemistry and Technology)*

b) Sources of computer basic knowledge

Figure 1. Computer basic knowledge source in participants to the survey



The survey showed that the 96.9% of responders commonly used computer. Computer use knowledge was getting by the sources described in Figure 1. Only 9.2% of responders were trained by specific courses followed in high schools or at the university (Figure 1).

c) Availability of computer and ICT facilities

ADSL Internet connection was used by the majority of responders familiar with computer use. Although Internet connection mode was apparently well known, concepts such as hardware and software features were not clearly perceived. Awareness of processor features and RAM/REM memories were known by 26.3% and 20.3% of interviewed pharmacists respectively. In terms of other available facilities such as, audio board, speakers and webcam, 58.5% of responders confirmed to have audio board, while 55.8% and 23.5% claimed to have speakers and webcam respectively.

d) Computer skills

Knowledge of computer terminology was evaluated using multiple choice questions. Despite claims of being aware about the meaning of words such as browser, operative system and HTML, some confusion on the significance of these terms was seen in the majority of questionnaires. Among 104 responders who claimed to know the meaning of browser, only 67.3% of them provided the right answer, 15.4% considered it as a search engine, and for 17.3% pharmacists it was just a network. The 60.7% of responders knew the meaning of an operating system. A lower percentage of responders (~40%) were aware of the HTML meaning.

Males were more informed than females about the meaning of the main computer-related terms (e.g. "browser") ($p < 0.05$; 40.3% vs 26.5%). Analysis of the responses by age revealed that younger professionals (up to 40 years) had, in general, a better knowledge of terms such as "browser" ($p < 0.05$; 40.0% vs 24.8%),"operative system" ($p < 0.05$; 76,7% vs 44.8%) and "HTML" ($p < 0.05$; 55.6% vs 24.8%) in comparison to older people.

Internet Explorer, Microsoft Word and Outlook Express were, in order, the most used applications. Less than 10% of responders used specific programs for pharmacy management.

e) General computer use habits

Many of computer users surfed the web and used e-mail applications. Both Internet surfing and e-mail were primarily used by pharmacists under 40 ($p<0.05$; 93.8% vs 72.3%, and 89.7% vs 62.2% respectively), with no significant gender differences. Over the 60% of responders used these applications for private purposes. Less than 30% of responders used Internet to find something and/or someone, to communicate (e-mail, chat, etc) or to consult databases for obtaining technical information.

f) Computer and IT uses in pharmacy practice

In general, computers are primarily used in pharmacies for pharmacy management. Notwithstanding this data, only 42.4% of responders claimed to use it for this purpose. A software, specifically designed for accounting

(Continued on page 55)

and organizational purposes, such as Excel, was mainly used by younger pharmacists (less than 40 years) than by older colleagues ($p<0.05$; 38.2% vs 15.1%). No significant gender-related difference was observed.

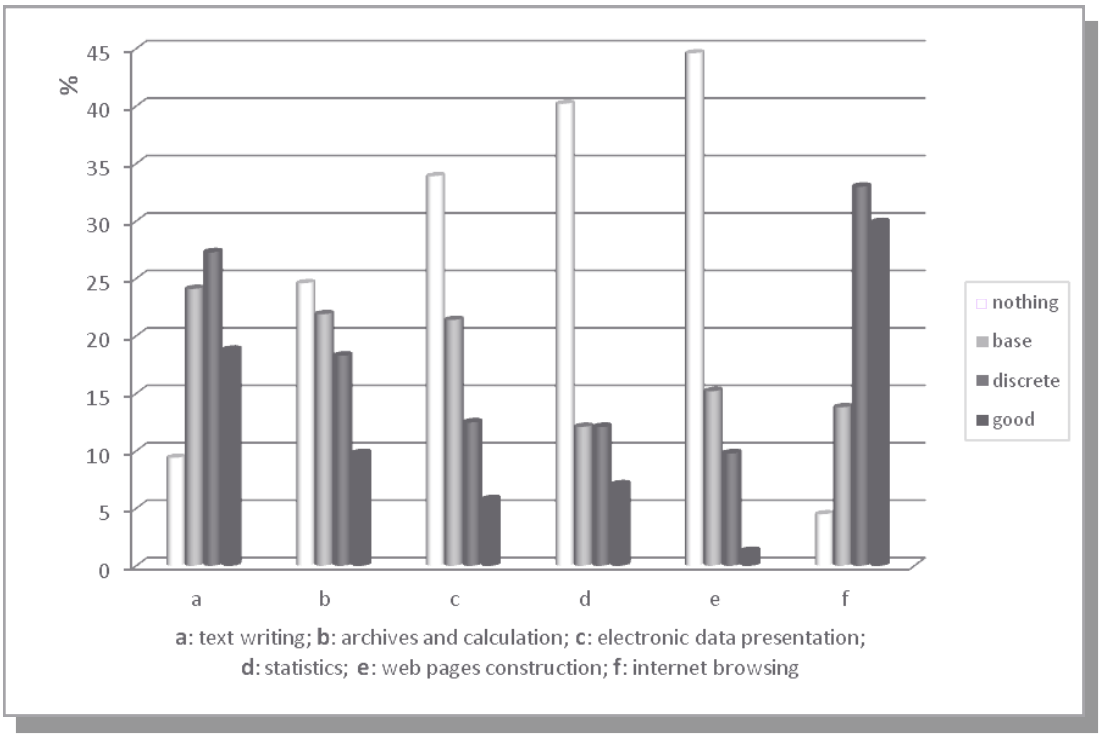
The e-mail was apparently more used for personal purposes (64.1%) than for pharmacy business. Only 7.8% of responders used e-mail to communicate with health authorities and less than 2% used it to be in contact with physicians or other health professionals. E-mail was the most used system for placing orders of drugs or other items available in the pharmacy (22.6%). In general, medicinal products were ordered using specific programs provided by wholesalers. ICT was used for training courses by less than 40% of responders. Among this group, only the 30.6% were satisfied with these educational resources.

Table 2: Importance and knowledge of different computer applications

	Importance		Knowledge	
	Fairly or very important (n.)	**%**	**Base or nothing (n.)**	**%**
Text entry	103	46.0	29	28.2
Archives and calculation	63	28.1	33	52.4
Preparation of slides	41	18.3	21	51.2
Use of statistical applications	43	19.2	31	72.1
Web page construction	25	11.1	19	76.0
Use of Internet applications	141	62.9	37	26.2

In terms of recognition of ICT applications relevance in pharmacy practice, Internet was considered to be most important (29.9%) or a quite important (33%) resource. Less popular software packages include statistics applications, web pages construction and electronic data presentation resources. Text entry and basic calculations were in a middle position (Figure 2).

Figure 2. Relevance assigned by respondents to various informatics applications



Data on knowledge of different computer's applications reflected the same trend above reported for recognition of relevance of ICT applications in pharmacy practice, being text entry and use of Internet applications the better known procedures (data not shown).

Table 2 summarizes data on knowledge and relevance of different computer applications, based on the rank of importance given by responders. Internet and text entry were considered the most important applications.

Discussion

Since 1988 Internet has generally changed habits and working organization with special reference to health professionals. For instance, until the 80's, search and collection of health/medical information and/or scientific data were a complex and time consuming work. Today thanks to Internet and other on-line databases we can update in real-time information and knowledge on a given topic.

In the pharmacy, computers are used for handling nearly all activities including drug dispensing, service quality improvement and collection of information for patients/customers. This study represents the first survey on informatics skills and literacy of pharmacists in Italy and gives an overview of the levels of computer science and ICT knowledge by community pharmacists working in central Italy (the Marche).

The approximate number of pharmacists working full time in public pharmacies in the Marche region at the time of questionnaire delivery was 2,500. Despite the relatively small size of the sample of professionals who answered the questionnaire (45.4%) (although this percentage is in line with the results of other studies on computer skills/literacy of pharmacists[13,17,18]) this study, could provide, at least, a contribution on the level of computer skills and ICT applications capabilities of a part of Italian pharmacists in their practice.

Analysis of collected data revealed a relevant percentage of self-learners to the use of computer. Moreover, it evidenced that Internet was the most used application. Most of responders who claimed to use Internet and other applications were up to 40, as shown by our results. This is in line with other similar researches conduced in Nigeria and India, where the knowledge and positive attitude towards computing were significantly influenced by respondent's age[14-16].

A good orientation of responders towards Internet is important to update their knowledge and to be the target of appropriate educational activities (e.g. life-long learning programs or other post-graduate educational activities). Moreover, apart from the reduced costs, the main advantage of Internet use, in this area, may be the potential flexibility of educational programs for professionals, avoiding the loss of working hours. Among Internet involved applications, WEB pages construction was less popular. Responders had little experience/ knowledge about this kind of software that if better known, could be useful to promote services or offers to customers (i.e. to provide commercial electronic services through the website[19]).

(Continued on page 57)

E-mail for its effectiveness (rapidity and low cost) represents the main communication system in institutional and professional interactions. In spite of these advantages, in pharmacy practice, this facility is primarily used for placing drug orders. The limited use of e-mail, mainly among pharmacists over 40, may be an example of inadequate use of ICT in pharmacy practice. These data should stimulate a reflection about needs of educational efforts that could lead to a larger/more correct use of ICT resources in daily pharmacy practice.

A comparison of our results with those of other studies assessing computer and informatics skills of pharmacists, and already mentioned in the introduction[14,15,17-20], reveals the differences discussed below. The Canadian and Greek studies involved a small number of pharmacists (106 and 88 respectively)[18,19]. In general the results of these studies were consistent with our data (e.g. statistical software use). A British investigation that similarly to the present study was proposed to community pharmacies, involved a larger number of professionals (747) than our survey[17]. The same study had a higher percentage of responders (n =386, 52%)[17]. A lower percentage of responders (20.6%) than our survey were reported in the Pharmacist online information literacy study, which involved 208 professionals[20]. The British study and our survey revealed a quite low percentage of pharmacists properly trained with specific courses for computer skills (24% and 9.2% respectively). This observation indicates the need of educational and professional measures for providing appropriate education on computer science among pharmacists. These measures should include the introduction of appropriate university courses in the pharmacist's curriculum to improve informatics knowledge. The US experience highlights the importance of academic education about informatics knowledge and skills that all graduating pharmacy students should possess[31].

A good computer literacy background was reported by two investigations performed in Nigeria[14,15]. These studies assessed computing knowledge, attitude, skills and utilization pattern of information technology among health care professionals and medical students. These investigations revealed also a quite high percentage of responders (90.5% and 82% respectively)[14,15]. Most healthcare professionals (88.4%) had positive attitude toward computing and this was significantly influenced by responder's age and previous computer training[14]. These data, if confirmed by other studies, could bring to the conclusion of a higher sensitivity of emerging economies than industrialized countries, to ICT education.

In terms of technological infrastructure, the widespread broadband availability was quite satisfactory in the Marche territory, but basic knowledge of end-users was not enough for guaranteeing the most profitable use of this facility. Lack of basic knowledge on ICT technological infrastructure was probably due to the self -learning of interviewed pharmacists.

Conclusions

(Continued on page 58)

In sum up, Italian community pharmacists are primary health unit. They are also widespread health centers in the Nation. In addition, they are involved in the modernization of the relationships between patients and health system (e.g. by reservation of specialist visits, by home pharmaceutical care for disabled patients, etc).

Therefore, it may be affirm that, although pharmacists play a relevant role in national health services, their computer skills and literacy are limited and probably not satisfactory. The modernization of national health services, including the Italian one, will move towards the replacement of pharmaceutical prescriptions, from paper to digital. This will result in advantages in terms of saving in economic resources and of safety bringing to a reduced number of prescription mistakes. This evolution requires better ICT knowledge and computer skills. Educational efforts (appropriate university courses about informatics knowledge and skills in the pharmacist's curriculum) should be encouraged for enlarging competencies in ICT of the community pharmacists of the future. Actually, the use of ICT will be useful to support community pharmacists for getting a better coordination with physicians/other health professionals and to help to provide up-to-date information and advice to patients. These professionals should be culturally more advanced for the benefit of patients and other customers of community pharmacy services.

Conflicts of interest Statement:

The authors disclose any financial and personal relationships with other people or organization that could inappropriately influence this work.

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