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**ICTs and Human Capital Obsolescence in the
Health Sector. The case of Portuguese Family
Physicians**

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Abstract

A key aspect of current reforms in Europe is, on the first line, an increased focus on the health system, with a central role for the “General Practitioner/Family Physician”.

Changes occurring in our society, namely due to the emergence of the New Information and Communication Technologies (NICT) in general, and the Internet in particular are surmounting. Issues such as the obsolescence of knowledge and levels of excellence tend to be raised in this context being particularly acute in the health sector. How to respond to the patient needs represents both a challenge and an opportunity to obtain better satisfaction on the job, better knowledge and better performance.

Although several studies were recently undertaken to evaluate the use of NICT by health professionals, no study, to the best of our knowledge, has focused on the relation between the use of such technologies and the scientific and daily medical activity performance of family doctors in Portugal. Moreover, it is important to assess physicians’ perceptions on the impact of NICTs on their human capital, namely to what extent these individuals perceive NICTs as a potential or threatening tool for upgrading their career prospects. Finally, the understanding and evaluation of the NICTs frequency and types of use as well as difficulties encountered is essential if one recognises these technologies’ potential for improving individuals’ human capital and welfare. Such evaluation might allow the development of adequate policy responses namely in what concerns training.

In the present thesis we performed an in-depth analysis of the role and impact of the NICTs, in particular in the Internet, on family physicians’ human capital. Using primary data gathered from a direct survey to the Portuguese General Practitioners, members of APMCG, we conclude that GPs that had previously undertook ICT related training and that are enrolled in more advanced formal education courses (masters and PhD) tend to consider the Internet as a critical tool for their medical daily practice and tend to use to a large extent the Internet both for professional and other purposes. These results are likely to put forward pertinent policy issues, namely the need for promoting ICT related training among Portuguese GPs, if it is to avoid the e-exclusion among the ‘back bone’ class of the health care system.

Keywords: General Practitioners (GPs); Human Capital; ICTs

Resumo

A Europa está a conduzir um conjunto de reformas estratégicas em vectores prioritários como o sistema de saúde, assumindo o Médico de Clínica Geral e Familiar um papel central.

As mudanças que estão a decorrer na sociedade, também elas próprias derivadas da emergência das novas Tecnologias de Informação e Comunicação (TICs) em geral, e da Internet em particular, são evidentes. Neste contexto, temas como obsolescência do conhecimento e níveis de excelência começam a ser fortemente considerados, assumindo sobretudo um papel acutilante no sector da saúde. Como responder às necessidades do paciente representa simultaneamente um desafio e uma oportunidade para obter melhor satisfação no cumprimento da função, melhor conhecimento e melhor desempenho.

Embora tenham recentemente sido elaborados vários estudos com o intuito de avaliar o uso das TICs pelos profissionais de saúde, não existe em Portugal, tanto quanto é do nosso conhecimento, um estudo com enfoque na relação entre o uso das mesmas e o desempenho, quer científico, quer da prática clínica, dos Médicos de Clínica Geral e Familiar. Cada vez mais é importante avaliar a percepção dos médicos relativamente ao impacto das TICs no seu capital humano, nomeadamente avaliar até que ponto é que estes agentes encaram as TICs, como uma ferramenta potencial ou intimista, para evoluir nas suas carreiras profissionais. Finalmente, para quem reconheça que estas tecnologias são potenciadoras da valorização do capital humano e do bem estar, a compreensão e avaliação do seu tipo e uso, bem como as dificuldades sentidas, é crucial. Esta avaliação poderá permitir o desenho de uma estratégia sustentada que promova respostas adequadas, nomeadamente no que diz respeito à Formação.

Na presente Tese desenvolvemos uma análise exaustiva do impacto e papel das TICs, em particular da Internet, no capital humano dos Médicos de Clínica Geral e Familiar. Utilizando dados primários, obtidos directamente de um questionário aos Médicos de Clínica Geral e Familiar, membros da APMCG, concluímos que aqueles que frequentaram acções de formação relacionadas com as TICs e que têm ou frequentam cursos de mestrado ou doutoramento tendem a considerar a Internet como um instrumento crítico para a sua actividade profissional.

Tais resultados levantam algumas questões de natureza política relevantes, nomeadamente a necessidade de promoção da formação nas TICs entre os MCGF portugueses se queremos evitar a e-exclusão desta classe médica que constitui a ‘coluna vertebral’ do sistema de saúde.

Palavras-chave: Médicos de Clínica Geral e Familiar; Capital Humano; TICs

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Introduction

At the Lisbon European Council in March 2000, government leaders set a 10-year mission for the EU to become the most competitive and dynamic knowledge-based economy in the world, capable of sustained economic growth with more and better jobs and greater social cohesion. Lifelong learning is a core element of this strategy, central not only to competitiveness and employability but also to social inclusion, active citizenship and personal development (EC, 2006).

Lifelong learning is particularly important to the family physician's professionals, especially if lifelong learning is described as a process through which these social players can maintain themselves updated. It indispensably integrates the set of developed activities carried out by a doctor (already qualified and skilled to practice its speciality) in order to renew, increment and update its professional capacities (Gomes, 2003). Being in a permanent state of alert of the technical-scientific and methodological developments, this is a necessary "activity" for the qualitative health care progress and better job satisfaction (Afzal et al., 2005).

The qualitative progress of the health care services reveals itself through the highest levels of knowledge, capacities and attitudes acquired and given to the patients. The professional satisfaction materializes itself through the change of routines, comparison of methods and results coming from benchmarking and cross evaluation, promoting a reflexive exercise and facilitating the social contacts.

The aim of the study is to give an account of the state of Portuguese family physicians daily practice and scientific performance, relating that with the process of human capital accumulation (through several activities, namely lifelong training), mediated by the use of New Information and Communication Technology (NICT). This professional group is having a more relevant and central role in Europe's current reforms and family medicine is "emerging from being a field of medicine practised by professionals with little specific training, to become a discipline with its own distinctive features, area of professional practice and corpus of knowledge" (Asvall, 1998: ix-x).

In Portugal, the introduction of family practice as a specific discipline is recent, going back only to the early 1980s, following the introduction of a National Health Service (NHS) in the 1970s (Conceição et al., 2000).

The family physicians are in the community, interact with it, are familiar with and evaluate its problems. Nevertheless, while secondary care has punctual and specific attendance, primary care represents the first step and the one which provides more personalized and continuous care (Oliveira, 2001).

The human health has its own geography, particularly diffuse nowadays, and health problems do not arise from stochastic ways. There is no geographic centre for the problems origins, and problems arise from factors that are non-apparently correlated, namely family violence, latent or open, stigmatised or socially consented, forgotten or mediatized. While family 'geographer', the family physicians identify the hidden reasons and many stories behind reasons for the consult that must be solved. They made a health and family disease map route based on indices and identified patterns, mapping diagnostics highways and adapted therapies to each individual and family reality. Underlying their way of thinking, there is always an epidemiological map and a disposable resource map that will be used according to his patient welfare (Sá, 2003).

In the actual organizational context, the Family Physicians still continue to have great power with their patients, probably being the professional group with the greatest potential of influence (Rebelo, 2004). For these reasons the Family Physicians of the future shall be used to give advice about psychosocial, family and sexual problems. They should also provide advice about lifestyles and, in particular, about all addictions. Furthermore, they will collaborate in promotional and educational health community activities. This systemic approach necessarily implies an attentive look through a pro-active way of acting in this area, in order to build a valid future without social exclusion and granting the implementation of routines promoting a continuous learning through life.

The present study aims at providing a detailed account on the use of NICTs, in particular the Internet, by Portuguese Family Physicians, and its relation with these physicians performance at the level of their daily practice and scientific achievement. In order to pursue such task, a general review of the literature focusing the relationship between human capital and performance linked to information and communicational technologies (ICT) is undertaken. This review is approached in two different but interrelated perspectives: economic and technological. The exercise of reviewing existing literature permitted to uncover an important issue - the potential impact of NICTs on human capital accumulation and obsolescence. The issue in the present study

is to assess in the health care system– through a direct survey - how and to what extent such impacts might be felt, focusing on the relation between NTICs and family physicians' daily practice and scientific performance.

The study is structured into three main chapters. In Chapter 1 an attempt is made to clarify the concepts of human capital and new information and communication technologies (ICT). Furthermore, an overview of the relationship between human capital and ICT is presented with a special focus on the issue of human capital obsolescence. A review of the literature focusing on the relation between human capital and ICTs in the health sector is performed in Chapter 2. In the final chapter (Chapter 3), we present in detail the methodology for gathering data and for undertaking the empirical work. Moreover, results are discussed in comparison with the relevant literature. Finally, in Conclusions we present in summary the main points raised by the present study, its main limitations, and uncover some neglected issues which would represent interesting areas for future research.

Chapter 1. Clarifying the concepts of Human capital and New Information and Communication Technologies

1.1. Defining Human Capital

1.1.1. The genesis of the concept

The concept of human capital was fully developed in the 1960s with the emergence of the human capital theory formalised by Schultz (1961) and Becker (1962, 1964). In his seminal work, *Investment in Human Capital: a Theoretical Analysis*, Becker (1962) included in his concept of human capital activities such as formal education and off-the-job training (general human capital) and on-the-job training (specific human capital). For this author, as well as for the majority of researchers who adopted the human capital framework, education, skills and human capital are interchangeable concepts. In particular, in the vast majority of human capital studies, "... education is the most important component of human capital" (Schultz, 1993: 17).

There are, however, an increasing number of authors who point to the fact that formal education is only one way to create skills. Arrow (1962) and Young (1992), among others, have stressed the role of other forms of skill improvement, such as 'learning-by-doing' and on-the-job training. More simply, and in accordance with a microeconomic view, the human capital concept can be divided into two main components: skill development, referring mainly to industry-related education and training (both formal and informal); and technological capability formation, which accounts for the development of individual and institutional skills and knowledge derived from technological effort (Lall, 1998).

These human capital ramifications highlight the intricate connection that exists between human capital and skills concepts (Teixeira, 2002).

1.1.2. Human capital and skills

Although skills and human capital are treated in countless studies as synonymous concepts (e.g., Harris and Helfat, 1997), more accurately they are distinct though interrelated concepts.

Skills can be acquired through education and (formal) training but also (and mainly) through the course of people's activities at work (i.e., learning-by-doing). Rosen (1986) points to the fact that most specific job skills are learned from performing the work activities themselves. Formal schooling complements these investments, both by setting down a body of general knowledge and principles for students, as well as teaching them how to learn.

1.1.3. Human capital, skills and “general knowledge”

‘General knowledge’ may be defined as the common scientific, technological, and cultural heritage potentially available to everyone (Aghion and Howitt, 1995). This suggests that know-how can be generated by learning-by-doing (working on the job) as well as by research.

Skills, therefore, appear as a chain concept linking human capital, knowledge and technology – much of “technology” being knowledge of certain sorts of skilled workers and differences in technology may in reality represent differences in the availability of certain skills (Wood and von Tunzelmann, 1996).

The operationalisation of such interrelation, however, has struggled with enormous difficulties. Notwithstanding, those same interrelationships can be useful to show that from the viewpoint of job performance there may be a substitution relationship between experience and training or education, or complementarity one.

Regardless of the issue of tangibleness, it is undeniable that skills and human capital are interrelated (Teixeira, 2002). For instance, Howell and Wolff (1991) distinguish between direct measures of skills (cognitive, interactive, and motor skills), which appear to measure independent dimensions of job skills and indirect measures of skills (educational attainment and earning indicators), and conclude that educational attainment is highly correlated with cognitive and interactive skills. Additionally, Lynch (1994) points out that cross functional competencies, “the requisite new skills”, are not easy to acquire informally, requiring instead a strong base of analytical, quantitative, and verbal skills that formal higher education is more likely to convey.

1.1.4. Human capital and performance

Many studies identify human capital as a pre-condition for and often a determinant of economic performance and international competitiveness (e.g., Aldcroft, 1992). In

addition, some authors argue that the process of industrial deepening and upgrading requires higher levels of skill, know-how and organisation in almost every function.

Human capital is not a visible factor. It comprehends two kinds of effects that differ specially from its expected benefits: internal and external ones (Teixeira, 1999). The internal effects are usually linked to the individual who owns the human capital (for example, the school level, training or professional experience impact in his income) and the external effects are spread through a specific group or cluster, through the society or even through a wide range of countries, and the human capital is kept, its knowledge (a formal or informal one) being an advantage competitive factor.

When people acquire skills they not only make themselves more productive, more able to produce more output for a given amount of effort, but they commonly also make them more adaptable (Boothe and Snower, 1996). For all these reasons, the acquisition of skills is a vital important activity (Teixeira, 2004).

1.1.5. Human capital, training and job performance

Ongoing changes in global economic structures have produced an environment where knowledge and skills, and by extension education and training, are considered increasingly valued commodities in the workplace. This trend is not only reflected in changes in today's employment requirements, where more years of schooling are expected of entry-level employees; it is also the basis of a perceived need to increase efforts at maintaining and upgrading work related knowledge and skills (Bouchard, 1998).

In the sixties, dissenting with then popular doomsday scenarios proposed by scientific groups such as the Club of Rome, Schultz heralded the advent of a new age in economics. He objected to the Malthusian view of ever diminishing resources, and of a world doomed for lack of unlimited natural capital. He did not subscribe the entropic view of human economics, where human survival was linked to the direct exploitation of the finite resources of the natural world. Instead, Schultz (1981) proposed that the key to economic growth lays in the "quality of the population" that comprised the economic unit. In Schultz's view, human beings themselves represent the greatest potential for economic prosperity.

Human capital is different from the other two forms of capital, often called "natural", and "machine" capital (e.g. the "forests", and the "machines" used for cutting them

down). Human capital, according to Schultz (1981: 61), represents "... those abilities and information that have economic value". The intangible inner resources of human beings thus replace material assets as the defining dimension of wealth. Furthermore, human capital is a renewable resource and, unlike other forms of capital, there is no theoretical limit to its supply!

Schultz also contended that education influences favourably "the ability to deal with disequilibria associated with economic modernization". With the recent explosion in technology and global competition, the nation's economic prospects seem linked more directly than ever to the development of a knowledgeable and well trained workforce, and hence to "human capital".

There is some debate, however, regarding the actual or "absolute" value of education in our changing economy. In order to derive some real measure of the relation between educational attainment and economic benefit, we would have to consider not only the levels of education found in today's workforce, but also other factors affecting employment and economic activity (Bouchard, 1998). One of the basic tenets of Schultz's Human Capital Theory is that training is a response to future needs, and that it represents a safeguard against the ever present threat of economic obsolescence. According to this view, today's training programs should prepare individuals for future economic and social challenges to come. However, forecasting human resources requirements is not an exact science. There is considerable doubt as to the feasibility and accuracy of such predictions (Bouchard, 1998). Thus, the development of "desirable" employee attitudes may be the next challenge of the post-modern organization, but it would be hazardous to consider such an objective as a replacement for training that actually produces useful skills, rather than confines them to the socialization of workers to organizational imperatives. As educational institutions play a central role in the development of human capital, they must change their role from being "dispensers of knowledge", and become places where people learn how to negotiate the paths of fluidly changing information and meaning (Bryce, 2002).

In the specific case of General Practitioners/Family doctors (GPs), aspects like human capital, skills, general knowledge, training and job performance are crucial. In fact, GPs are specialist physicians and personal doctors, primarily responsible for the provision of comprehensive and continuing care to every individual seeking medical care irrespective of age, sex and illness. They care for individuals in the context of their

family, their community, and their culture, always respecting the autonomy of their patients. They recognise they will also have a professional responsibility to their community. In negotiating management plans with their patients they integrate physical, psychological, social, cultural and existential factors, utilising the knowledge and trust engendered by repeated contacts.

With a continuous changing world, General Practitioners/Family physicians must be aware, among others, about trends, solutions, tools and processes, as they have to exercise their professional role by promoting health, preventing disease and providing cure, care, or palliation. This is done either directly or through the services of others according to health needs and the resources available within the community they serve, assisting patients where necessary in accessing these services. The holistic vision of this vital professional category makes the GPs key elements, truly aware of their own responsibility for developing and maintaining their skills, personal balance and values as a basis for effective and safe patient care.

1.2. New Information and Communication Technologies (NICTs)

1.2.1. Defining ICTs

New Information and Communication Technologies (NICTs) may be defined as the convergence of electronics, computing, and telecommunications (Kenaroglu, 2003). It encompasses many aspects of computing and technology, and the term is more recognizable than ever before. The information technology umbrella can be quite large, covering many fields. IT professionals perform a variety of duties that range from installing applications to designing complex computer networks and information databases. A few of the duties that IT professionals perform may include: data management, computer networking, computer engineering, database systems design, software design, management information systems and systems management or system administration,¹ including the most mediatised one, the Internet. NICTs have unleashed a tidal wave of technological innovation in the collecting, storing, processing, transmission, and presentation of information that has not only transformed the information technology sector itself into a highly dynamic and expanding field of activity - creating new markets and generating new investment, income, and jobs- but also provided other sectors with more rapid and efficient mechanisms for responding to

¹ Wikipedia, accessed on August 2007.

shifts in demand patterns and changes in international comparative advantages, through more efficient production processes and new and improved products and services (e.g. replacing mechanical and electromechanical components, upgrading traditional products by creating new product functions, incorporating skills and functions into equipment, automating routine work, making technical, professional, or financial services more transportable) (Freeman, 1982; Kenaroglu, 2003).

1.2.2. The relevance of Information and Communication Technologies (ICTs)

All sectors of the economy have been influenced by the development of ICTs applications: information technology opens up greater opportunities for the exploitation of economies of scale and scope, allows the more flexible production and use of labour and equipment, promotes the internationalization of production and markets, offers greater mobility and flexibility in capital and financial flows and services, and is frequently the precondition for the creation of innovative financial instruments (Kenaroglu, 2003).

Information system developments are constantly being applied to increase the productivity, quality, and efficiency of finance, banking, business management, and public administration (Kabundi, 2005).

The adoption of ICT, combined with increased economic integration among countries, is transforming economic and social systems, much like the “electricity revolution” did in an earlier episode of economic history (Ásgeirsdóttir, 2002). In fact, ICT is the most important driver of modern economy. First, it is a leader of innovation and second, it can also help in the main societal challenges facing Europe: an ageing population, globalisation, unemployment, and the need for a better management of energy resources (Reding, 2006). For these facts, ICT must efficiently be adopted in all sectors of the economy as key for the European productivity revival and enhancing the impact of ICT must be a policy priority for Europe (EC, 2006). Many entities claim (e.g., EC, 2006), that without ICT, there would be no growth and no jobs. The same entities argue that Europe cannot afford to waste the opportunity to catch-up with its competitors and appropriate policy frameworks are needed, as well as, clear pro-innovation regulations, more investment in research, efforts to ease the deployment of new applications and policy support measures to encourage take-up (EC, 2006).

The advent and diffusion of the ICT cluster of technologies is considered a major force of productivity and economic growth (Antonelli, 1993). Theoretical views that implicate ICT innovation is fundamental socio-economic changes have been proposed, and are captured in concepts such as the “information economy” or the “knowledge society” (Foray and Lundvall, 1996; Mansell and When, 1998).

ICT has been identified as an important part of the present “techno-economic paradigm” (Avgerou and Rovere, 2003). The concept of techno-economic paradigm was developed in the eighties by economists (Dosi, 1982; Freeman, 1982; Perez, 1983) who wanted to explain how the creation, use and diffusion of new technologies affect companies’ competitive strategies and the dynamics of economic development. The concept has been used to refer to a set of guiding principles, which become managerial and engineering common sense for each major phase of development (Perez, 1983; Freeman and Perez, 1988). A change in paradigm carries with it many clusters of radical and incremental innovations and has pervasive effects throughout the economy, spreading from the initial industries where it takes place to the whole economy (Laursen et al., 2002). The techno-economic paradigm is a combination of technical, organizational and institutional innovations that provoke transformations in the whole economy and have a considerable influence in behaviour (Avgerou and Rovere, 2003). A new techno-economic paradigm involves the creation of new sectors and activities, new ways to create and diffuse information and knowledge, new models of commercialisation, new strategies and policies and new modes of operation of public and private institutions. ICT-related industries are developing very fast and inducing economic growth in several countries (Lastres and Ferraz, 1999).

In this context, the ability to transform information into knowledge is essential for the enterprise. This requires a process of interactive learning that includes the activities of learning-by-doing, learning-by-using, learning-by-searching and learning-by-interacting (Avgerou and Rovere, 2003). Generated knowledge may be codified or tacit. For example, Capello (1999) made an empirical analysis of Italian high-tech enterprises and observed three types of learning processes: learning based on external know-how; knowledge based in internal competencies; and collective learning based on cooperation links. The more innovative firms were those where collective learning dominated.

ICT can mediate the organizational changes required to enhance the competitiveness of the firm (Agrassio and Abreu, 2000). This is why the literature suggests that firms will

gain competitive advantage with ICT only if they align their information systems with their competitive strategy or if they implement organizational changes (Baile and Sole, 1995; Bielli, 1998; Agrasso and Abreu, 2000). However, when adopting new technologies, SMEs generally prefer ready-made solutions because of their own lack of competence in evaluating the benefits of the new technologies for their business.

ICT is no magic bullet: it often takes many years of heavy investment before any money is saved. More often than not, savings are never realized, because tasks change, or because the presence of the ICT stimulates newer and higher demands on the work performed (Berg, 2002).

Nevertheless, the fact is that ICT is changing the way of being in the world and it is performing new trends at all levels, areas, activities and professionals. ICT has enabled health professionals to obtain and share increased amounts of health care information (Baker et al., 1995 in Mullaney, 1997), to track and monitor diseases (Snacken et al., 1998; Centers for Disease Control,² Heymann and Rodier, 2001), to collaborate, communicate, and interact among the professional class (Wang and Wong, 1997), to search for the latest information on clinical protocols in different medical specialties and patient management and to consult with specialists and seek continuing medical education (Duetsch, 1995; Burnham, 1996).

In the specific case of General Practitioners/Family doctors the Internet seems to be of increasing importance as a consequence of the efficiency of communications, the accessibility of on-line evidence-based medicine reviews, and the need to assist patients in selecting reliable Internet resources (Ebel and Frame, 1996; Diaz et al., 2002).

1.2.3. ICT and General Purpose Technologies

ICTs are generally seen to be pervasive technologies (Freeman and Perez, 1988; Helpman, 1998) which may affect the organization of production in all sectors.

More recently, economists have made attempts to formalise the introduction and effects of pervasive technologies, under the label General Purpose Technologies (GPTs) (Bresnahan and Trajtenberg, 1995; Helpman, 1998). The notion of General Purpose Technologies (GPTs) was first coined by Bresnahan and Trajtenberg in a conference contribution from 1991 and later published as Bresnahan and Trajtenberg (1995). GPTs

² <http://www.cdc.gov/nchs/about/major/ahcd/ahcd1.htm>.

are radical new ideas or techniques that have the potential for important impact on many sectors of an economy. Bresnahan and Trajtenberg identified three key characteristics: pervasiveness (they are used as inputs by many downstream sectors), technological dynamism (inherent potential for technical improvements), and “innovational complementarities” with other forms of advancement (meaning that the productivity of R&D in downstream sectors increases as a consequence of innovation in the GPT). Thus, as GPTs improve they spread throughout the economy, bringing about generalised productivity gains. In general, the literature focuses on the comparison between the social optimum and the outcome of a decentralised economy in the presence of GPTs which are characterised by innovational complementarities giving rise to increasing returns to scale.

The recent ICT “revolution” can be seen to be one such GPT, since today, computers and related equipment are used in most sectors of the economy. ICTs have also displayed a substantial level of technological dynamism spurring not only radical improvement in computational capacity (following Moore’s Law), but also a successive wave of new technologies (ranging from the semiconductor to the Internet). Moreover, ICTs have seriously facilitated new ways of organising firms, including the decentralisation of decision making, team production etc. (Milgrom and Roberts, 1990; Brynjolfsson and Hitt, 2000; Bresnahan, Brynjolfsson and Hitt, 2000). Thereby ICTs have clearly exhibited innovational complementarities with other forms of advancement.

d’Orville (2000) claims that ICT is one of the most powerful forces driving the globalisation process, a process which transforms states and affects all sectors of human activities. A decade ago, the World Bank declared that Information Technology (IT) is a major driving force for a new techno-economic paradigm with far reaching effects for all types of industries and services and for the competitive positioning of developing countries (Hanna, 1991).

1.2.4. ICT as an enabler of the development process

ICT is widely recognised as a formidable and effective development tool (Pye, 1999) and the “new” technology is believed to allow “leapfrogging”. Leapfrogging is the idea that countries and societies can jump over one or more generations of technology and

that the poor nations can thus move more rapidly to the modern Information Age (Nath, 2001)

Another claim is that ICT also enables the “knowledge revolution”. Proponents of this view base their claim on the belief that ICTs are effective tools for creating, disseminating, storing and managing information. Knowledge can thus become a basic resource for economic and development activities in society (Nath, 2001). Castells (1998: 92) also argues the importance of using ICTs to make the creation of a knowledge society possible:

“the ultimate objective is a knowledge and information society – one with the ability, capacity and skills to generate and capture new knowledge and to effectively access, absorb and use information, data and knowledge with the support of ICTs.”

However, as Castells himself points out, it would be a mistake to believe that access to information is the same as having immediate possibilities for creating knowledge. Between information and knowledge there is a long way to go and it is essential that the user can adopt information and create knowledge on his own terms. A similar thought can be found in Liedman (2002).

1.2.5. ICT, organizational and occupational change

The increasing global interdependencies and the accelerating pace of change demand more flexible and adaptive organizations (Malone and Crowston, 1991). Malone and Crowston (1991) have defined organizational flexibility in terms of "vulnerability" and "adaptability." Effective implementation of IT would decrease vulnerability by reducing the cost of expected failures and enhance adaptability by reducing the cost of adjustment. Bennis (1974) notes that organization's response to the environment will continue to be the crucial determinant for its effectiveness. Since post-industrial organizations will be faced with increasing environmental complexity and turbulence, organizations' needs to process information and make decisions will be substantially increased (Huber, 1981).

Recent authors (e.g., Brinkhorst, 2004) have recognized that ICT is a potential enabler of new types of work organization. Immediately following the changing environment of the mid-1980s, a number of authors (e.g., Hitt and Snir, 1999) proposed new work systems to contrast to the traditional "mass production" style of organization that dates back to the beginning of the industrial revolution. In batch manufacturing processes

such as automobiles, new types of organization such as flexible specialization (Piore and Sabel, 1984), high performance work systems (Ichniowski et al., 1996; MacDuffie et al., 1996), and lean production (Womack et al., 1991) have appeared. These general principles have also been examined by others in broader samples of the economy and in more narrowly defined industries such as metalworking (Osterman, 1994). While the exact description of these practices varies, they generally involve a combination of flexible machinery, skilled employees, and increased delegation of authority to line workers ("empowerment"), either through teams or through increased individual discretion.

In this complex context, the capabilities and flexibilities of computer-communication systems make them increasingly relevant to organizations by being able to respond to any specific information or communication requirement (Holt, 1992).

For ICT-based change to be effective, technology, business processes, and organization need to be adapted to each other (Benjamin and Levinson, 1993). Indeed, comparing the present 'Information Revolution' with the Industrial Revolution, Malone and Rockart (1993) point that the latest changes in ICT would lead to the evolution of new technology-intensive organizational structures. They project that the advances in ICT would result in dramatic decline in the costs of "coordination" which would lead to new, coordination-intensive business structures. Complementarily, Rockart and Short (1989: 7) suggest that ICT would enable the firms to respond to the "new and pressing competitive forces" by providing for "effective management of interdependence". Milgrom and Roberts (1990), for instance, cite CAD systems and manufacturing automation as being complements to these types of work practices. Brynjolfsson et al. (1997) in turn describe a case where new flexible production technologies failed to meet expectations in terms of productivity improvements until they were coupled with increased delegation of authority and a team-based production structure. Hicks (1970) indicates that integration of computers and communication networks with decentralization of decision rights to line workers improves organizational performance. Ichniowski et al. (1996), in contrast, quote ICT as a potential barrier to the diffusion of workplace innovation; although high productivity gains are possible with these work practices, diffusion may be slowed because of the need to make complementary investments in information technology. Hitt (1999) indicates that the value of computer controlled machinery increases with flexible work practices.

In the same line of arguments, a study carried out by Cândido and Araújo (2003) shows that ICT is among the most important technological changes affecting the economy, and that employers who use ICT usually co-invent new approaches to workplace organization and new product and service offerings. ICT and the co-inventions together change the mix of skills that employers demand, often substituting computers for low skill work while complementing work that requires certain cognitive and social skills. This study also shows that IT use is correlated with a new workplace organization that includes broader job responsibilities for line workers, more decentralized decision-making and more self-managing teams.

1.3. Relationship between human capital and ICT: the issue of human capital obsolescence

1.3.1. The importance of human capital in the effective use of ICT

The ICTs tools are developing at a very fast pace, changing rules and obliging new ways of doing and learning (Zussman, 2002). Nowadays (N)ICTs are used for work and leisure, for gathering information, for communicating, for shopping, for banking, and for a myriad of other everyday tasks. Its increasing importance in our everyday lives has led to speculation about the effects of living in a world where so much is available through computers (Coget et al., 2002).

Highly endowed human capital individuals may profit more from ICTs as they may represent a powerful instrument to acquire, disseminate, manage and change information and experiences (McKenna and Bargh, 2000; Jakobsson, 2006).

When tastes and technologies are changing rapidly, requiring a high rate of labour turnover across industries and occupations, adaptability is crucial for keeping labour and capital employed and maintaining competitiveness (Progetto, 1997). Beyond that, people who acquire skills make capital equipment more productive (Orlikowsk and Yates, 1994). They make more effective use of the machines they work with and they enable managers to introduce mores sophisticated and productive machines. Without a workforce that is continuously acquiring new skills, it would be difficult to reap more most of the returns from technological progress (Boothe and Snower, 1996).

Internet worked human capital raises challenges and opportunities for all business, including the health sector (DOT Force, 2001).³ Human capital now extends beyond the firm; people resemble molecules moving across the firm's porous membrane in ever-changing configurations.

1.3.2. NICTs and the changing contents of human resources' tasks

The technological revolution is often quoted as the most pressing reason why education and knowledge are becoming valuable economic commodities (Bouchard, 1998). However, in recent years, we have been moving from "task specific" definitions of training needs, to more inclusive or "generic" views of employee qualifications. Since it has become increasingly difficult to predict the direction of future shifts in technology and the economy, it seems more advantageous to target competencies that can be transferred across a wide range of tasks, rather than those that can only be applied to specific work environments.

Today, government and employers claim that even with unprecedented levels of education, employees are lacking fundamental competencies necessary to maintain a competitive edge in the new economy (de Silva, 1997). Individuals are expected to be responsive to technological changes, to be interested in seeking out flexible organizational alternatives, and to share with their employers a sense of autonomy and responsibility for the job. It is no longer satisfactory for employees to perform well, they must now also want to. They are expected to be proactive and to display an eager willingness to confront change with innovative ideas. The "generic skills" have moved from an experiential, to a cognitive, to a cultural/affective dimension (Schutze, 1992).

One of the problems associated with the "improved skills" theory is that no matter how much training a person receives, the possibility of applying that knowledge is directly dependent on the opportunities found in the job market. Accordingly to Berg and Gorelick (2003) there can be problems in countries that educate a stratum of the

³ The DOT Force was formed in the fourth quarter 2000. 43 members have participated in its work: 1) 17 government representatives: - "G8+1" Governments (Canada, France, Germany, Italy, Japan, Russia, United Kingdom, United States of America and a representative from the European Commission); - Developing countries Governments (Bolivia, Brazil, Egypt, India, Indonesia, Senegal, South Africa, Tanzania). 2) 7 representatives from International/Multilateral Organizations (ECOSOC, ITU, OECD, UNDP, UNCTAD, UNESCO, World Bank). 3) 11 representatives from the private sector (one representative per each G8 Country and three global networks: GIIC, GBDE, WEF). 4) 8 representatives from the non-profit sector (one representative from each G8 Country).

population whose occupational expectations are well beyond the opportunities the economy may provide in the short or even the long run.

High tech jobs require new technical skills, while repetitive jobs have been taken over by machinery (Perrolle, 1987). However, increases in skill level requirements are not as widespread as is generally believed. Automatization and computerization as a rule have made tasks easier, not more difficult. This is the phenomenon that Rubenson (1992) has described as the simultaneous "upskilling" of a small part of the work tasks, with the simultaneous "deskilling" of the larger portion.

1.3.3. Human capital obsolescence and Information Technology

Obsolescence of human capital lies at the heart of the economic challenge the economies face: to realize the transformation towards a knowledge-based society by means of lifelong learning (EC, 2006). Human resources are playing a central role in the knowledge economy that emerged in the Western world as the human capital embodied in both high-tech capital goods and the working population is a main determinant of the performance of individuals, organizations and national economies.

Human resources stimulate technological change, whereas technological change stimulates the use of human resources. First, human capital is an important input factor in Research & Development (R&D), which is in particular emphasized by endogenous growth theory (e.g. Romer, 1990). This is called the research effect of human capital (Cörvers, 1999). Second, high-skilled workers are of crucial importance for the diffusion of new technologies in the various sectors of the economy (Bartel and Lichtenberg, 1987). This is the diffusion effect of human capital.

The 'White Paper' on Growth, Competitiveness, Employment of the European Commission (1993) argues that a highly skilled labour force in the European Union is required to catch up in the technological race with other developed countries. The Lisbon 2000 strategic target of the European Council (2000) that Europe should "become the most competitive and dynamic knowledge-based society of the world" by 2010 emphasizes the importance of a highly skilled labour force for the competitive power of national economies.

Driven by the rapid developments in ICT, technological developments increase the complexity of jobs in almost all sectors of the economy. Already in the 1960s, Cipriano (1967) argued that individuals may gain secondary skills to maintain options against

technological obsolescence. The threat of obsolescence would then decrease the amount of investment that an individual would make in the skills associated with a particular occupation. Conversely, Melnik (1969) indicated that there is a growth potential in most occupations that can be gained through further investments in occupational skills. This author uses a continuous growth model to show that the growth potential from continuous training may offset the obsolescence and lead to greater investments in the skills of a particular occupation.

At a more macroeconomic level, the link between technological innovation and destruction of workers' skills, and more generally the information capital accumulated within the economic system, has been examined in a number of recent studies. Aghion and Howitt (1994) study the relation between growth and unemployment. They demonstrate that, since growth depends on the rate of technological change and rapid growth increases the rate of labour obsolescence and workforce turnover, there is a positive correlation between growth and unemployment. Caballero and Hammour (1996) analyse the efficiency of creative destruction with special reference to the cyclical timing of labour force reallocation, but they do not specifically study the growth process. Finally, Jones and Newman (1995) suppose that technical progress tends to destroy the economy's accumulated informational capital. For these reasons, they argue, while innovation results in a potential increase in the yield of the new economic activities that it makes possible, at the same time it reduces the yield of existing activities.

The obsolescence of human capital introduces two additional forces, which distance the competitive allocation of resources from the socially optimal one: the human capital replenishment effect and the cost-side intertemporal spillover effect (Carillo and Zazzaro, 2000). Both of these represent sources of market overinvestment in R&D.

Technological innovation tends to supersede the skills workers have acquired, imposing continuous costs for training on them (Carillo and Zazzaro, 2000). Obviously, part of these externalities is internalised by the labour market. First, learning costs and the likely destruction of the human capital built up create a floor for wages. Below that level, workers drop out of the labour market altogether. If learning costs are very high, then the risk of destruction of one's skills create a supply-side constraint within the labour market which, in equilibrium, can generate positive unemployment. When learning costs are low enough not to prevent anyone from labour market participation,

however, human capital destruction might affect firms' choices only if learning is not equally costly in all sectors and workers can move freely between them (Carillo and Zazzaro, 2000).

In any case, the effect of human capital destruction can only be internalised up to the cost of learning the skills needed to produce the latest generation of goods. For future learning costs – i.e. - those connected with subsequent to the latest generation – there simply exists no market on which such costs can be discharged.

In the knowledge society we are living in, it must always be present that a more differentiated and complex set of skills is required for a range of possible "uses" of ICT, related to the acquisition of various kinds of knowledge, access to relevant services, entertainment, communication, interaction and participation to "virtual" networks and communities, etc (SEC, 2003).

These more general cognitive, interpersonal and communicational related skills are increasingly seen as crucial for a real inclusion– and active participation - in the knowledge society, as the expression of fully fledged citizenship.⁴

Self responsibility for developing and maintaining the skills, personal balance and values as a basis for effective and safe patient care are not per se the guarantee of the effective and efficient usage of ICT. On the other hand, the effective usage of ICT is not the assurance the best performance and latest knowledge.

Society and trends are changing, new technologies and sub-consequent skills are needed, flexibility and empowerment are more than ever required, continuous learning and skills updating are indubitably crucial for good performances and especially self-recognition.

In the challenging case of General Practitioners/Family doctors (GPs) these questions are particularly relevant. How to assure the best care to the patient? How to be sure that the practices being applied are the best? How to be convinced that everything that could be done has been experimented? How to be, at the final, tranquilized with our own ethic, professional and living being?

The service and attendance to the patients will be reflected in the welfare of the community and at the end it will be the reflex of the development's country level.

⁴ "New literacies and e-Learning Competencies", by Tapio Varis, in <http://www.elearningeuropa.info/>, accessed on May 2007.

Chapter 2. Human capital and ICTs in the Health Sector. The Particular Case of Family Physicians/GPs

2.1. Initial considerations

Health care is costly for several basic reasons. It deploys expensive technology (Docteur, 2003); indeed, the more advanced a system is in terms of early adoption and quick diffusion of new innovations, the higher the costs tend to be (Docteur, 2003). And with ongoing developments in areas like imaging, pharmacology and biotechnology, pressures to spend more are likely to continue (Docteur, 2003). Health care is also labour intensive, meaning large costs for highly-trained doctors, nurses, support staff and, increasingly, management and administration. These labour costs tend to rise with GDP (Docteur, 2003).

Since resources are limited, every society must make trade-offs in its health care system when pursuing multiple goals, such as equity, efficiency, quality, and cost control. The benefits a society is willing to give up in exchange for other advantages will depend on its beliefs and values as well as on the prevailing political possibilities (Hsiao and Yip, 1999).

In any economy the health care sector is one of the most important sectors, representing one of the largest service industries in developed countries (Viscardi Group,⁵ 2007; Kaiser Family Foundation,⁶ 2007; Institute for the Future,⁷ 2007). Currently its output accounts for about 7% of GDP in the EU-15, larger than the roughly 5% accounted for by the financial services sector or retail trade sector (O'Mahony and van Ark, 2003). Therefore trends in productivity and efficiency in this sector will have a large impact on these performance measures in economies as a whole. Moreover, the performance of the health sector tend to affect the competitiveness of the overall economy via its effect on labour costs, labour market flexibility and the allocation of resources at the macroeconomic level (Klaus-Dirk, 2004). The final output of this sector – ensuring a healthy population – is likely to impact on the productive capacity of the workforce in general and so it will have consequences across all sectors of the economy (Bloom et al., 2001; EC, 2004; López-Casanovas et al., 2005). Hence the functioning of the health

⁵in <http://www.gratzer.co.at/arbeiten/viscardi/divisions.html>

⁶in Kaiser Family Foundation

⁷ in www.iftf.org

sector has an important impact upon the standards of living in Europe's citizens (Rutten, 2006).

Notwithstanding, evaluating performance in services, and in the public sector in particular is fraught with difficulties (O'Mahony and Stevens, 2002). Doing so for the health sector is more difficult than in other service sectors since both, the system of provision and the nature of the production process, have a number of unique features (EC, 2004). First, the health care sector is subject to a high degree of Government intervention, intervening both directly, through provision and funding, but also indirectly, through regulation (Santerre et al., 1991; Poterba, 1995; Ham, 1997; O'Mahony, 2004). The historical result was a greater emphasis on ensuring efficiency with many countries moving away from regulation towards more market oriented solutions in the 1990s (Cutler and McClellan, 2001). In some ways, the health sector is just like any other service sector. Inputs such as capital, labour, and materials are employed to produce health care outputs. The output of the health sector is the increase in the health of the population and a healthier economy is in general a wealthier one. Health has been shown to play a significant role in determining economic growth (Bloom et al., 2004), as depicted in the following figure.

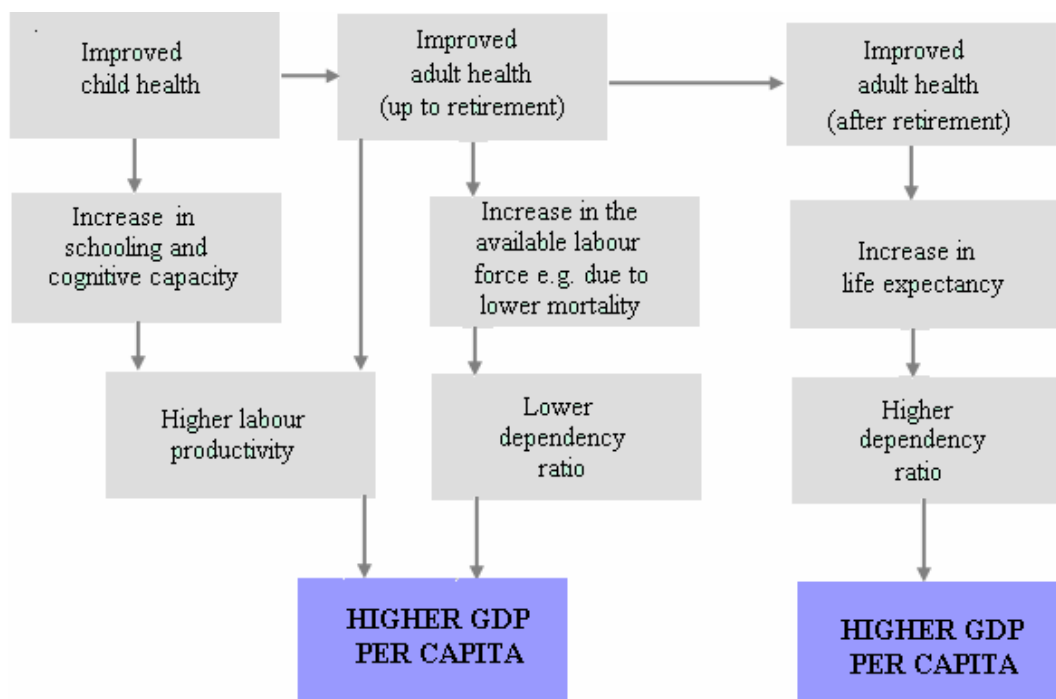


Figure 1: The relationship between Health and GDP growth

Source: Adapted from Bloom et al. (2004).

Given what was said above, the following sections present theoretical and empirical evidence on the health sector, identified here as a complex system (Section 2.2), especially focused the case of Europe and Portugal (Section 2.3), where human resources assume a critical importance (Section 2.4), in particular if they are General Practitioners/Family Medicine Physicians (Section 2.5), and where human capital and ICT impacts may do the difference (Section 2.6). The following sections intend to detail existing findings in the area and identify the main common hazard between human capital, ICT and how these latter's impact occurs at the health care level.

2.2. Health Sector as a complex system

The provision of health care involves putting together a considerable number of resource inputs to deliver an extraordinary array of different service outputs (WHO, 2000). Few, if any, manufacturing processes match the variety and rate of change of production possibilities in health. Figure 2 identifies three principal health system inputs: human resources, physical capital, and consumables. It also shows how the financial resources to purchase these inputs are of both a capital investment and a recurrent character. As in other industries, investment decisions in health are critical because they are generally irreversible: they commit large amounts of money to places and activities which are difficult, even impossible, to cancel, close or scale down (WHO, 2000).

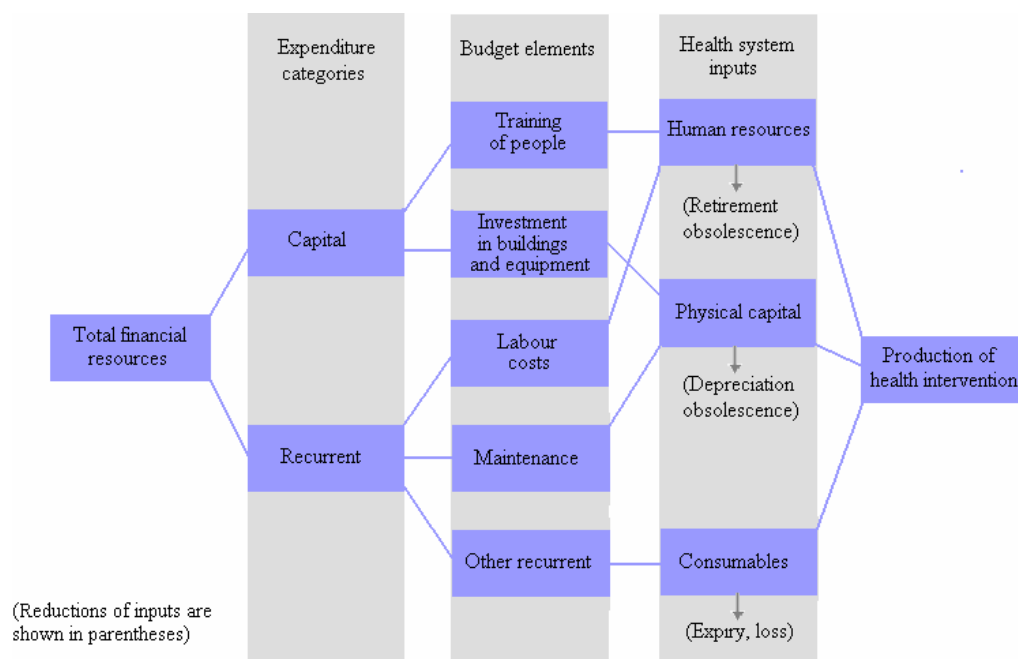


Figure 2: Health system inputs: from financial resources to health interventions

Source: The World Health Report 2000.

Capital is the existing stock of productive assets. Trained health workers and mobile clinics, as well as fixed assets, are part of the capital stock of the health system. Investment is any addition to this stock of capital, such as more pharmacists or additional vehicles. The typical productive lifetime of different investments will vary from as little as 1–2 years for certain equipment to 25–30 years or more for buildings and some kinds of professionals (WHO, 2000).

Technological progress influences the economic lifetime of a piece of capital: old investments quickly become outdated as new and improved technologies emerge. The way in which assets are managed also affects their lifetime.

Human capital can be treated conceptually in the same way as physical capital, with education and training as the key investment tools to adjust the human capital stock and determine the available knowledge and skills (Becker, 1993). Unlike material capital, knowledge does not deteriorate with use. But, like equipment, old skills become obsolete with the advent of new technologies, and human capital needs to be maintained too. Continuing education and on-the-job training are required to keep existing skills in line with technological progress and new knowledge. Human capital is also lost through retirement and death of individuals.

Investment also refers, in a broader sense, to any new programme, activity or project. Capital investment costs are all those costs that occur only once (to start up the activity), while the recurrent costs refer to the long-term financial commitment that usually follows from such an investment. If the available medical technology is seen as “capital”, and research and development as the investment tool to expand the technology frontier and develop new ideas, these concepts may also be applied to diagnostic equipment, medicines and the like (WHO, 2000).

2.3. An overview of the Health Care System in Europe and Portugal

The structure of the health care system is a key factor for its efficiency (Oxley and MacFarlan, 1994; Hollingsworth et al., 2004; Nichols et al., 2004). Across the EU, and indeed internationally, a number of different approaches to providing health care are apparent. The EU enlargement has introduced even greater diversity into the range of health care systems in the EU. The consequences of enlargement and the challenges that lie ahead not only for the new Member States but also the impact on the existing

members are the subject of much current discussion (Busse, 2002; MacLehose and McKee, 2002).

Health care is extremely labour-intensive, perhaps more than any other public sector activity (Bjornberg, 2005). With more than six million workers, health and welfare constitute one of the most significant sectors of the economy in the EU, providing employment for 9.7% of the EU workforce (European Commission, 2002). While health care consumes between 7% and 11% of the gross domestic product (GDP) in western European countries, approximately 70% of health budgets are allocated to salaries and other charges related directly to employment. In spite of the variation in expenditure within the EU, all EU countries spend substantially less on health care as a percentage of GDP than does the US (WHO, 2007) (cf. Figure 3).

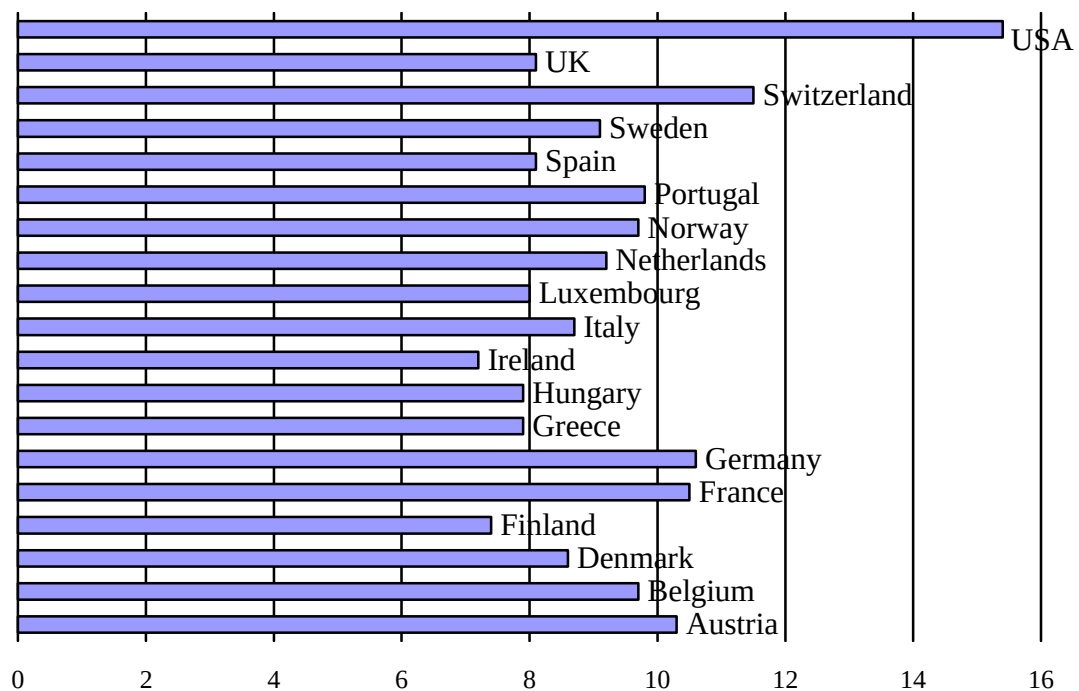


Figure 3: Total Health Expenditure in the EU and USA, 2004 (percent of GDP)

Source: WHO – World Health Statistics, 2007

Figure 4 also shows that although public expenditure in the US accounts for a considerably smaller proportion of total health expenditure than the EU, per capita public health expenditure in the US is still higher than all EU countries but Luxembourg and Norway.

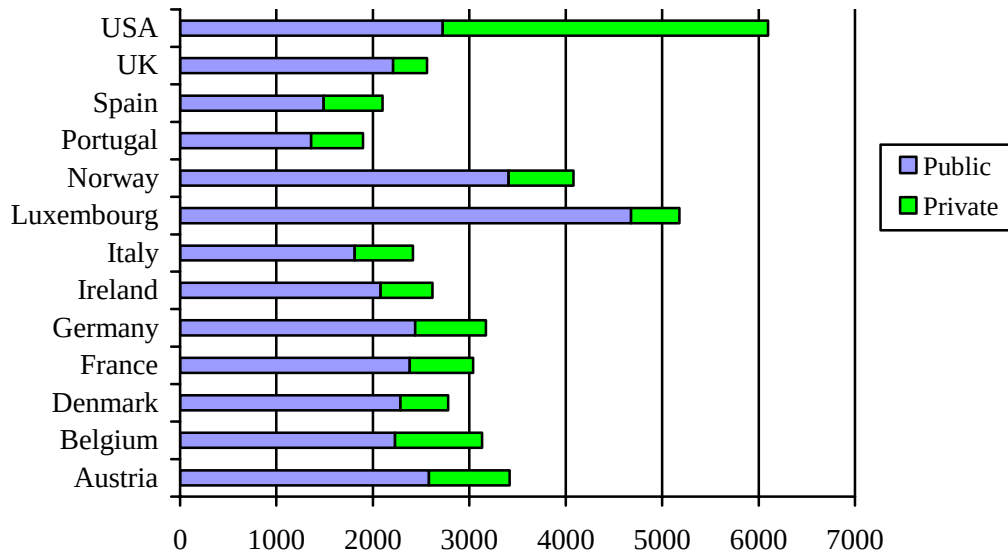


Figure 4: Per capita Public and Private expenditure on Health at international dollar rate, EU and USA, 2004

Source: WHO – World Health Statistics, 2007

Considerable variation exists between countries in terms of the number of health care professionals. While a country may not have an overall shortage of physicians, in some countries there is a tendency to have an oversupply of certain specialists while at the same time experiencing a shortage of generalists (Saltman and Figueras, 1997).⁸

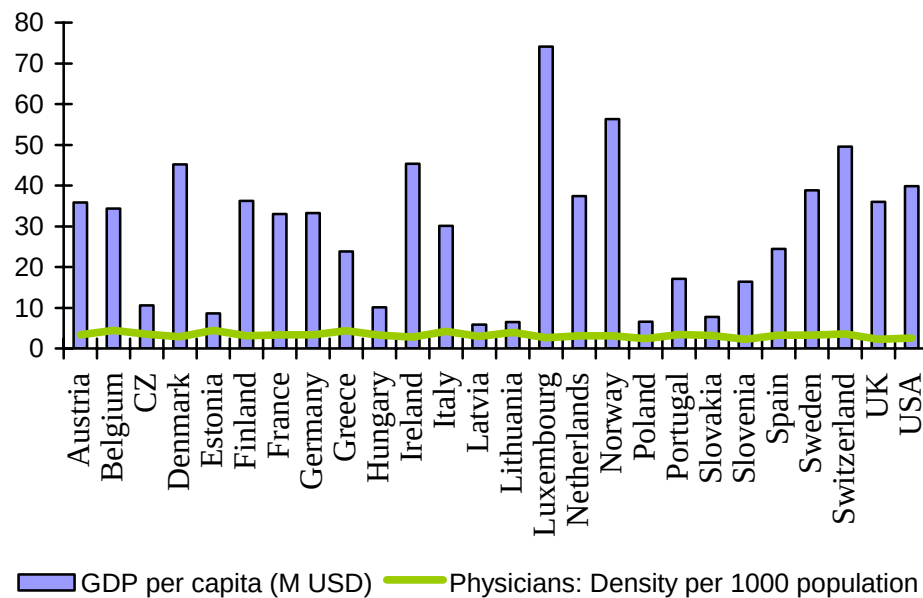


Figure 5: Comparison of GDP per capita and Density of Physicians per 1000 population / 2004

Sources: WHO – World Health Statistics, 2007; International Monetary Fund 2004

⁸ Saltman and Figueras (1997) discuss some of the factors that have resulted in an oversupply of physicians in certain areas of Europe, which include historical and cultural factors and a tendency to substitute labour for capital. They report that medical unemployment has not lessened this problem and suggest that entry to (especially private) medical schools should be monitored.

Although the GDP per capita in Europe differs significantly from country to country, the density of physicians per 1000 population does not really seem to highly diverge. This comparison allows to conclude that whatever the level of a country, it should have a reasonable number of physicians – an evidence of the importance of these professionals in the community.

Many EU countries are engaged in a process of reform with greater emphasis on efficiency targets, but the pace of reform will be determined by the historical evolution of systems of provision and preferences regarding equity. However, the literature suggests that the success of such reforms is dependent on the information available to individuals (European competitiveness report, 2004). Improving the efficiency of the health sector, securing benefits from advanced technology at reasonable cost, and ensuring equity and quality of services and products are major challenges facing the EU.

In fact, applying information and communication technology (ICT) to a given medical domain is not merely adding a new technique (van der Lei, 2002). When applied to a medical domain, ICT has the potential to radically change processes in that domain and in its ability to close the loop.⁹

Focusing our analysis now on the Portuguese health care system, we might state that it is characterized by three co-existing systems: the National Health Service (NHS), Special Public and Private Insurance Schemes for certain professions (health subsystems) and Voluntary Private Health Insurance (Bentes et al., 2004). The central government through the Ministry of Health is responsible for developing health policy and overseeing and evaluating its implementation. It is also responsible for the coordination of health-related activities of other Ministries, such as Social Services, Education, Employment, Sport, Environment, Economy, Housing and Urban Planning. The core function of the Ministry is the regulation, planning and management of the NHS.

Like most European systems, the Portuguese health care system is a mix of public and private financing. The NHS, which provides universal coverage, is predominantly

⁹ In their paper ‘Health care in the information society: a prognosis for the year 2013’, Haux and co-authors provide us with a set of predictions based on progress in three main areas: (1) patient-centred recording and use of medical data for collaborative care; (2) process-integrated decision support; and (3) comprehensive use of patient data for research and health care reporting.

funded through general taxation,¹⁰ and in 1998 it was the second largest employer in the public sector, with 19% of the total public workforce.¹¹ Nowadays, the NHS employs 123962 people, being 24% of these professionals physicians (Portugal – *Ministério da Saúde*). Moreover, it is important to notice, that more than 25% of those physicians are General Practitioners (GPs), also called Family Medicine Physicians (IGIF, 2004).

Primary Health Care in Portugal is delivered by a mix of public and private health service providers. Most primary health care is delivered by GPs in the health centre setting. However, some health centres also provide a limited range of specialized care. This is a result of the integration of social welfare medical services into the National Health Service at the end of the 1970s (Bentes et al., 2004).

Primary health care in the public sector is mostly delivered through publicly funded and managed Health Centres (HCs). The number of Physicians in the total HCs (Continental) represents nearly 29% of the total HC Employees (IGIF, 2004), with GPs (85%) being the greatest players in this context.

Although the HNS is currently suffering a process of changes and reforms, the major Centres have no financial or managerial autonomy and are directly run by the Regional Health Administrations (RHAs). The Ministry of Health allocates funds to the RHAs, which in turn determine the budget of each centre based on historical and activity costs.¹²

Secondary and Tertiary Care is mainly provided in Hospitals whose services are provided according to the integrated model, i.e. directly by the NHS.

2.4. The critical importance of human resources in Health

Human resources, the different kinds of clinical and non-clinical staff who make each individual and public health intervention happen, are one of the most important of the health system's inputs (WHO, 2000). The performance of health care systems depends ultimately on the knowledge, skills and motivation of the people responsible for delivering services.

¹⁰ In 2004, the main source of finance (71,9%) come from the public sector (Source: Portal da Saúde, 2007).

¹¹ European Observatory on Health Care Systems, 1999.

¹² Similarly to the ratio of populations density, 59% of the NHCs in Portugal are located in the North and Centre regions (Source: Direcção Geral da Saúde, 2004).

Health systems are labour intensive and require qualified and experienced staff to function well (WHO, 2000). In addition to a balance between health workers and physical resources, there needs to be a balance between the different types of health promoters and caregivers. It would be an obvious waste of money to recruit physicians to carry out the simplest tasks. As a particular health system input is increased, the value added by each additional unit of input tends to fall (Folland et al., 1993).

A health system can have plentiful human resources, with excellent knowledge and skills, but still face impending crisis if future health needs, priorities and available resources are not taken into account (WHO, 2000). For example, where the education and training for junior doctors and nurses functions poorly, or where senior staff lack adequate time and resources to update their knowledge and skills, future shortfalls can be expected. Similarly, a health system with a skewed age distribution among staff towards the point of retirement poses a real problem. Thus, a health care system should balance investments in human capital to cover future needs as well as present demands.

People, as thinking creatures, are very different from machines and human capital cannot be managed in the same way as physical capital. First of all, human resources, and in particular physicians, determine the use of other available inputs. An oversupply of physicians will almost certainly mean an oversupply of the kind of services that physicians provide (The World Annual Report, 2000).

Another difference between human and physical capital, which affects how people are managed, is that physicians, nurses and other health workers are not motivated only by present working conditions, income and management. They are also influenced by what they believe those conditions will be in the future, based on past experiences, views expressed by others and current trends (WHO, 2000). If qualified staff believes that future payment, benefits and working conditions will deteriorate, their job-related decisions and motivation will reflect that belief (WHO, 2000). This “shadow of the future” can easily result in a continuing negative spiral towards lower motivation and performance (WHO, 2000).

Moreover, growth in the available knowledge or advances in technology – such as new drugs or diagnostic equipment – can substantially increase the capacity of human resources to solve health problems, and thereby improve the performance of a health

care system.¹³ New knowledge is also a challenge to each country's existing input balance, as relative prices change and the efficient mix of resources alters (Weisbrod, 1991).

2.5. General Practitioners/Family Medicine Physicians: current status and main challenges

General Practice/Family Medicine is an academic and scientific discipline, with its own educational content, research, evidence base and clinical activity, and a clinical specialty orientated towards primary care (WONCA, 2002).

General Practitioners/Family Doctors (GPs) are in principle the first point of contact for an unselected group of patients. Health education, preventive activities, early detection, problem oriented care, terminal care and palliation are the tasks GPs should be able to address and perform, as well as the coordination of the specialists' treatment and knowledge in all existing services within the local health care system.

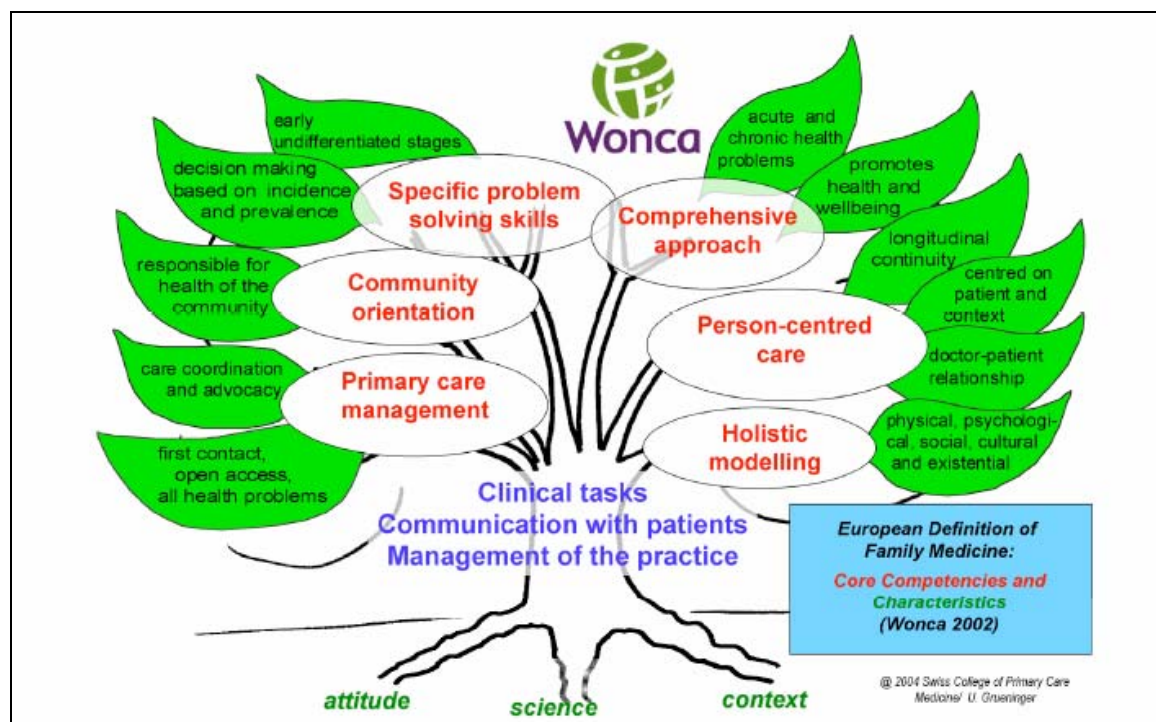


Figure 6: WONCA Europe 2002 Definition of Primary Care

Source: WONCA Europe

GPs are also the ones to counsel and guide patients with chronic diseases such as diabetes, cancer, asthma, respiratory and cardiac disorders, as well as being responsible

¹³ World Health Organisation, The World Health Report 2000. Health Systems: Improving Performance. Chapter 4, "What Resources are Needed", pp. 81f., <http://www.who.int/whr/>.

for the basic care of psychosomatic disorders. Last but not least they must be able to treat and follow-up poly-morbid and terminal patients.

In addition, GPs should be familiar with all common diseases in the community and with all preventable conditions. They should be familiar with the therapeutic principles of pharmaceutical products, their side effects and interactions, since they prescribe most of the medicaments in ambulatory care. They must also consider the treatment possibilities in other medical fields in order to be able to advocate their patients.

The result is that GPs should have special communication skills, since he/she has to inform patients on their diseases and treatment options in a way adjusted to the individual patient but inserted in a community. This interrelationship, full of responsibility, commitment and know-how, should guide and be reflected in the development of related agendas for teaching, research and quality improvement, consequence of the impact and vital paper assumed by these professionals in the economy and subsequent welfare.

These professionals are represented all over the World by Wonca¹⁴ and have an European regional branch.¹⁵ There is also an European Union of General Practitioners and Specialists in Family Medicine in Europe called UEMO.¹⁶ In Portugal, APMCG is the Portuguese Association of General and Familiar Practitioners, which congregates half of the Portuguese professionals of this class.¹⁷ The total number of Portuguese General Practice/Family Doctors sums up approximately 6000 (UEMO, 2007).

Perhaps the greatest challenge facing any health care system is how to adapt to the increasing pace of change (Kohn et al., 1999). Despite the clear importance of this workforce, many influential reports have suggested that existing systems to optimize its contribution are out of step with developments in health care systems (Kohn et al., 1999; NHS, 2000). One area where this is seen as important is the management of quality of care. While professional freedom continues to be the hallmark of medical

¹⁴ Wonca stands for “The World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians”: it is a world wide organization representing General Practitioners and Family Doctors. Created in 1972, it unites over 200 000 doctors in 79 different countries (WONCA, 2007).

¹⁵ Wonca Europe has more than 30 member organizations and represents more than 45.000 Family Physicians in Europe. It has about 400 direct members (WONCA, 2007).

¹⁶ UEMO, the European Union of General Practitioners is the organization for General Practitioners and Specialists in Family Medicine in Europe. Approximately 400 000 General Practitioners/Family Doctors from 21 countries in Europe are now represented in the UEMO via their national medical organizations (UEMO, 2007).

¹⁷ Gathered from <http://www.apmcg.pt/>, accessed on 2007.03.12.

practice in many countries, increasingly this independence has been stigmatized as a source of runaway costs and lack of responsiveness to consumers and purchasers of care (Light, 1993). Several reports of high-profile cases of medical mismanagement have raised concerns that the regulatory system may not protect the public effectively or guarantee continuing competence (Beecham, 2000).

Family physicians are, on daily basis, involved in a huge variety of activities. They treat patients with acute disease, reassure patients with self-limiting disease, take care of chronic patients, counsel patients with psychorelational problems, and prevent health problems through information and screening programs. They take part in interdisciplinary teams managing the care of a terminally ill patient, organize 24-hour continuity of care, help to identify health threats in the community, strive for equity and accessibility of health care, and advocate health care for illegal residents. Family physicians invest considerable personal commitment and energy in a wide spectrum of interventions (De Maesener and De Sutter, 2004).

The facts are that, first of all, family medicine has a unique ecology (Green et al., 2001). The family physician has the first contact for all kinds of health problems, deals with a huge variety of problems, mostly in the early stages.

Also the context is of utmost importance (Di Blasi, 2001). Nonmedical factors such as the doctor-patient relationship, the cultural context, the occupational context, support networks and socioeconomic context, they all influence the diagnostic and therapeutic approach and the final outcome. There is, for example, empirical evidence that enhancing patient expectations improves outcomes (Di Blasi, 2001).

For the above mentioned reflexions it seems obvious that research and up-to-date knowledge Family Practitioners are crucial, as they have to up live up to their patients' expectations as well as their peer's group. Of course, the realization of this goal is, however, complex. Any research in this domain must take into account many different dimensions and foci and bear in mind the specificities of the General Practice.

The framework presented by De Maesener and De Sutter, in the *Annals of Family Medicine* (May/June 2004) describes in a very interesting way the different research questions where factors such as basic knowledge, problem-solving approach, practice implementation, policy context, and education can cross through dimensions like structure, process and outcome.

As a continuous process, General Practitioners/Family Medicine Physicians must be conscientious about the way things are changing. They must always be knowledge up-dated and being knowledge up-dated demands, first of all, a self-responsibility upon the society and community where he/she lives, a respect for human and life and, above all, pride for being helpful and valuable. Continuous learning, sharing of experiences and information, integration and systematization of all knowledge are essential (Seufer and Seufer, 2000). Being recognized by all society for their “status” and prominent role is also a key-factor for the way the equity of knowledge may be guaranteed for all, avoiding situations of disable digital and technological divide.

The Internet has been recognized for many years as an important, if concerning, mechanism for transforming medical care (Kassirer, 1995; Silberg et al., 1997; Gingrich and Magaziner, 2000; National Research Council Networking, 2000; Purcell et al., 2002; Blumenthal, 2002). While questions remain about its limitations (Kleinke, 2000) concerns regarding misinformation (Impicciatore et al., 1997; Culver et al. 1997; Pealer and Dorman, 1997; Wyatt, 1997; Griffiths and Christiansen, 2000; Purcell et al., 2002; Meric et al., 2002) and potential difficulties with the confidentiality of personal information (Pennbridge et al., 1999; Fox et al., 2000) the Internet appears to show promise as a means to disseminate information about health and health care, enhance communication, and facilitate a wide range of interactions between patients and the health care delivery system. These kinds of changes could produce important improvements in health.

Nonetheless, the Internet clearly is an important tool with the potential to improve information dissemination and perhaps to improve health care delivery and outcomes. Continuing efforts to maximize the potential of this tool could have great value (Baker et al., 2003).

Internet can provide another means of disseminating information such as practice guidelines to physicians in different specialties caring for patients with similar medical problems and could possibly reduce practice differences (Eitel et al, 1998). It can provide immediate access to clinical protocols, authoritative textbooks (Kassier, 1995) and peer-reviewed medical journals, consultation with specialists and continuing medical education (Ellenberger, 1995).

Rapid advances in ICT are revolutionising healthcare across the world (Clark, 2006). It could be argued that ICT is merely a powerful technological support to traditional ways

of providing care, which will remain unchanged except for improvements in efficiency, safety, and effectiveness. Alternatively ICT could be seen as a trigger for the pursuit of a totally new healthcare paradigm that is focussed on a different kind of relationship a true partnership with patients who will be much more involved in and take control of their own health and healthcare management (Clark, 2006).

Few data concerning Internet users are available in the medical literature to provide guidance in developing this medium for physicians (Eitel et al., 1998). As more physicians gain familiarity with the Internet, it is expected they will integrate it into their clinical practices (Eitel et al, 1998). For these reasons it is crucial to carry on a study focused on the relation between the use of such technologies and the scientific and daily medical activity performance by Family Doctors, as it might permit to devise adequate policy responses namely in what training is concerned.

2.6. Human capital and ICTs relationship in the Health sector – the specific case on General Practitioners

The health care sector, with its many professional subgroups, complex work processes and power structures, represents a much more fluid and dynamic context with fewer formalised control mechanisms (Helmreich and Merritt, 1998). Little is known of the role or impact of ICTs in these complex, dynamic domains where individuals must juggle multiple interleaving tasks and sift through uncertain and changing evidence (Westbrook et al., 2004). Importantly, the models needed for the analysis of these complex socio-cultural systems are very different from more traditional ones used to analyse control, procedural and implementation strategies. More comprehensive evaluation approaches are required which include techniques that are able to account for not merely the technical and routine aspects of work, but also the social, organizational, cultural and cognitive dimensions of work (Kaplan, 2001; Hofstad, 1998).

A key component of the EU's renewed Lisbon strategy for growth and jobs is the "i2010". It stands for a package of proactive policies to harness the potential of the digital economy to deliver growth, jobs and modern, on-line public services.¹⁸ It also provides tools for good governance, including better regulation commitments and

¹⁸ i2010 is the European Commission's strategic policy framework laying out broad policy guidelines for the information society and the media in the years up to 2010. It promotes an open and competitive digital economy, research into information and communication technologies, as well as their application to improve social inclusion, public services and quality of life

progress reports. Information and communication technologies (ICTs) are a powerful driver for economy-wide productivity, growth and jobs – and are arguably Europe’s best-bet investment for the future. The ICT sector contributes to a quarter of the EU’s GDP growth and investment and innovation in ICT generate around 45% of EU productivity growth. Internet or other computer networks sales represented 8.5 % of total enterprises' sales, according to the Community 2004 survey.

In Health the information is vital, as information is the feature to clinic decisions. Recent empirical evidences show that applications related to the ICT origin better save-timings, efficiency and quality in the handled services (Ortiz and Clancy, 2003; Teixeira and Brochado, 2005). Despite this enormous ICTs potential in the management health area, so far there has been scarce evidence for the Portuguese case. An exception is a study carried out by Teixeira and Brochado (2005), which shows that ICTs have a non negligible impact in health organization, generating time-savings, and increasing users’ and health professionals’ satisfaction. Curiously, this study also reveals that human capital component related to professionals’ experience is inversely correlated to efficiency, although this later is directly correlated to higher health workers’ education.

According to a recent research (2006) conducted by Manhattan Research (Taking the Pulse® Europe), European physicians (more rigorously, those from France, Italy, Germany, Spain and United Kingdom) have embraced the Internet for professional purposes and are generally positive about the value of the Internet as a professional and education resource, with 62% of ‘all’ European physicians reporting the Internet is essential for their practice today (see Figure 7).

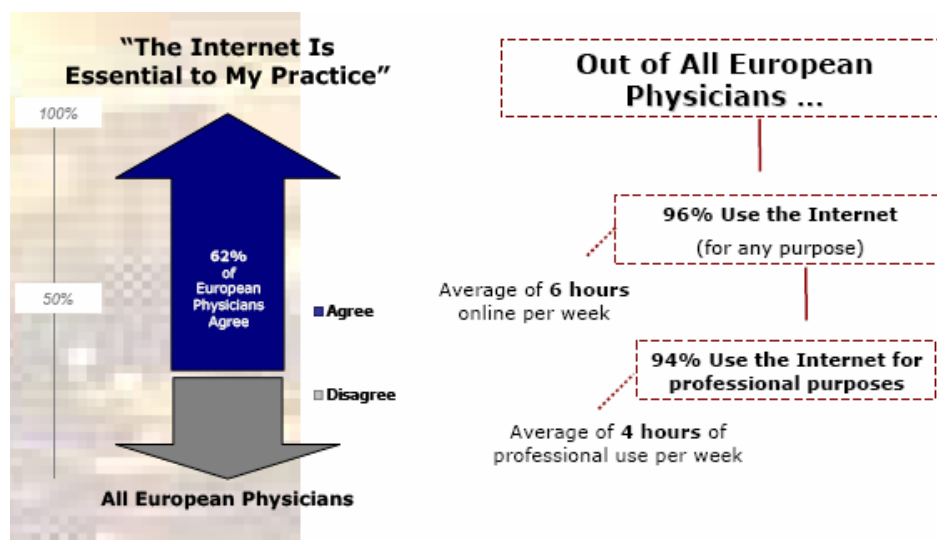


Figure 7: Level of Agreement the Internet is Essential, Frequency of Access

Source: Manhattan Research (2006)

Furthermore, the study found that 94% of all ‘European’ physicians report using of the Internet for professional purposes in the past 12 months. Clearly, the Internet has moved beyond being a “diversion” to becoming an accepted information, education, and communication channel for almost every practicing physician in Europe to some extent.¹⁹

Understanding recent and expected physician use of IT, and physician attitudes toward use of IT, can provide insights into the potential pace of physician adoption of IT that can substantially improve patient safety and quality of care (Miller et al., 2002). The diffusion of innovation literature, which has emphasized differences in types of innovation adopters (Rogers, 1995) suggests that understanding differences in types of physician IT users can provide managers, IT vendors, and private/public policymakers with additional insights. This heterogeneity of physician IT users has implications for the likely pace of IT implementation, the pace of efficiency and quality gains that can be reaped from new IT, and policies required to increase that pace (Miller et al., 2002).

¹⁹ Also the King’s College London School of Medicine, for example, is exploring the relationship between doctors, patients and computers practice through a pilot study. Researchers are identifying really interesting trends towards an increased use of computers in the consultation, of e-mail and the world reminders for patients and the use of remote, palm-held devices by health care professionals (<http://www.kcl.ac.uk/depsta/medicine/gppc/itrg.htm>, accessed on August 2007).

Chapter 3. Human Capital and ICTs relation in the case of the Portuguese Family Physicians: Methodological underpins and main results of the survey

3.1. Initial considerations

In this chapter we describe the methodological issues related with the questionnaire implemented targeting Portuguese family physicians or General Practitioners (GPs). In the following section (Section 3.2) we describe the questionnaire relating them with this thesis' main research questions. Afterwards (Section 3.3) the representativeness of the sample is assessed and the descriptive results are presented. In Section 3.4, the use of the ICTs and General Physicians' human capital profile is put forward through an econometric model. Finally, and based on the earlier (descriptive and econometric) results and GPs perceptions, we discuss whether the use of ICTs implies human capital obsolescence.

3.2. Target population and representativeness of the sample

Portuguese GPs represent the largest fraction of Portuguese medical class – out of the almost 24 thousand medical professionals one quarter are GPs (Martins et al., 2003). Their large amount and regional dispersion makes it difficult to implement in a large scale any research works aiming this important medical class. Aware of this difficulty we undertake a pragmatic approach. The *Associação Portuguesa dos Médicos de Clínica Geral* (APMCG), Portuguese GPs renowned association, embraces a large proportion (around fifty percent) of GPs. Thus, in a first phase, we contacted the APMCG and with the collaboration of its President, Dr. Eduardo Mendes, we established a research plan and afterwards we signed a protocol which turned this research plan and the underlying survey feasible. The APMCG, using its web site and a direct mailing to its associate members, publicized our questionnaire and in its 24th Meeting gave a wide coverage to our survey trying to increase the response rate of our survey. Through these joint efforts we achieved around 250 responses, which was a rather low response rate (8%). In a second phase we complement the first strategy with a wide (1500) direct mailing (funded by CEMPRE-FEP) to GPs enrolled in the North Section of the Physicians Order (*Ordem dos Médicos da Região do Norte*). This second

intent was also not very well succeed but still enabled to increase the response rate to approximately 11% (342 valid responses).

Our experience indicates that for reaching a higher and significant response rate one would need to apply to higher bodies within the Ministry of Health in order to collect their collaboration and obtain in this way an additional factor of credibility among GPs. A complementary, although extremely costly, approach would be to implement the questionnaire personally, by contacting GPs in their workplace (mainly Health Centres).

Although the response rate is well below our expectations, given our time restrictions, we reckon that this provides a useful basis for a preliminary but rigorous assessment of GPs use of ICTs in general and the Internet in particular, and the relation of the latter with GPs' (scientific and daily practice) profile.

3.3. Description of the questionnaire and main research questions

The questionnaire (in Appendix) was developed and pre-tested during the first semester of 2007. The questionnaire is divided into five main parts: 1) General data (age, gender, education, workplace, professional category, type of labour contract, and region where the workplace is located); 2) level and intensity of usage of ICTs/Internet of the Portuguese GPs; 3) Training and sources for knowledge updating; 4) activities related with GPs daily practice (number of patients seen; number of medical prescriptions; hours dedicated to managing/bureaucratic issues); and 5) GPs scientific practice and performance (participation in conferences and publications in journals).

The survey was implemented through an online inquiry (<http://www.fep.up.pt/mgfpportugal>) with the support of the Computing Services of FEP. This necessarily conveyed a bias toward those GPs that have minima conditions for ICTs/Internet usage (computer and web availability). Nevertheless, this does not question our main research goals:

1. To characterize Portuguese GPs ICTs/Internet usage.
2. To relate GPs Internet usage with GPs' medical practice and scientific profile.
3. To assess whether the Internet fostered or prevented GPs' human capital obsolescence.

To the best of our knowledge, no study exists in Portugal focusing these questions. At the international level, some studies (e.g., Drezner (1998), Eitel et al. (1998), Miller et

al. (2002), Kwon and Xie (2003), Baker et al., 2003; Bryant (2004), Martin (2004), Miller and Sim (2004), © Health On the Net Foundation (2005), Andrews et al. (2006), Lowrey and Anderseon (2006), ManhattanRESEARCH (2006), Royal Society (2006), Wessel et al. (2006), P\SL Research (2007),— see Table A1, in Appendix, for a summary of these studies' main methods and outcomes) already focused the issue of Internet use, its reasons and determinants, but did not related that with the GPs profiles and potential for human capital obsolescence. It is also interesting to assess the extent to which Internet use intensity depends on GPs profile, that is, whether GPs that use the Internet most are those most active in scientific terms (participation in conference and publication in scientific journals) and/or those most active in terms of medical daily practice. Moreover, as the literature surveyed in Chapter 2 indicates, ICTs/Internet have a potential for both upgrading and downgrading individuals' human capital. Thus, it is pertinent to evaluate what is the case for Portuguese GPs.

3.4. Descriptive results

3.4.1. GPs general description

Most of Portuguese GPs surveyed (approximately 80%) are 40 years or older. The mode group, that is, the one representing the bigger quote (51%), is the one 50-60 years old. According to data available in UEMO - European Union of General Practitioners - the average age of Portuguese GPs /Family doctors is 40 years,²⁰ a number similar to the one presented by the 2001 Portuguese Global Social Balance (Portugal, Ministério da Saúde, 2001). According to this latter report, the average age in the National Health Service (NHS) is 41,4 years, whereas in the study carried out by Marques et al. (2005) the corresponding figure is 44,3 years.

²⁰ <http://www.uemo.org/>, accessed on August 2007.

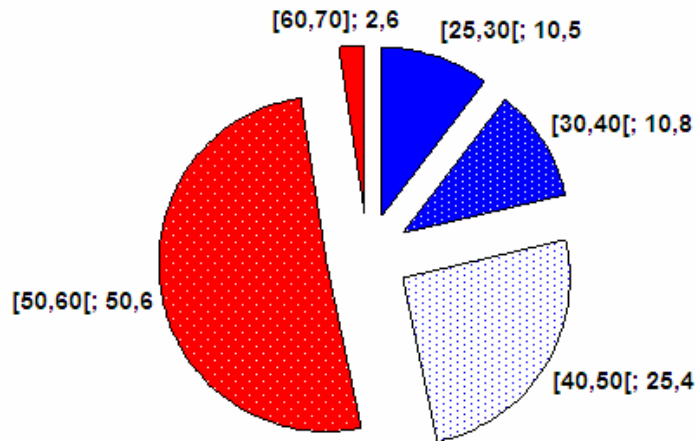


Figure 8: Distribution of GPs by Age

The GPs are almost equally distributed by gender, with a slight advantage for male GPs. According to UEMO, there are more males GPs (56%) than females (44%), and a similar conclusion was reached in the Marques et al.'s (2005) study, referring the respective percentage 51,2%.

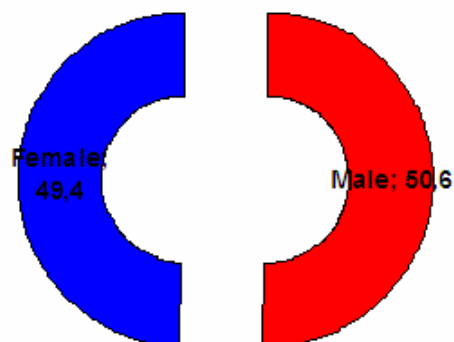


Figure 9: Distribution of GPs by Gender

A small number of GPs possess post graduation studies (namely those that grant a degree - master and DPhil). The bulk of GPs (70%) took their under graduate course more than 20 years ago, which in part is reflected in their age profile. This nevertheless raises serious concerns to these professionals' capability to absorb and use the NTICs in general and the Internet in particular.

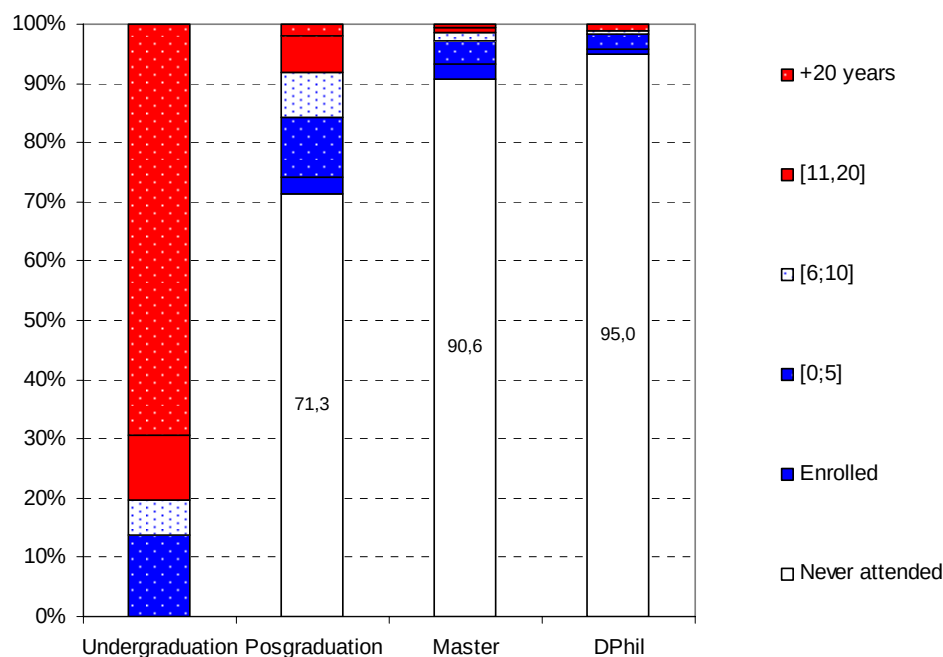


Figure 10: GPs formal education – distribution according to education’s tenure

Over 70% of the sample is not even enrolled in any kind of degree. Although this does not exclude the possibility that these GPs might be (or were) enrolled in other type of training, such magnitude uncovers an effective risk of a large part of Portuguese GPs be unable to reap the benefits of NTICs.

A large percentage (42%) of GPs admitted that in the last year they did not take any professional training targeting ICTs. Those that did undertook rather short-term (less than one week) courses.

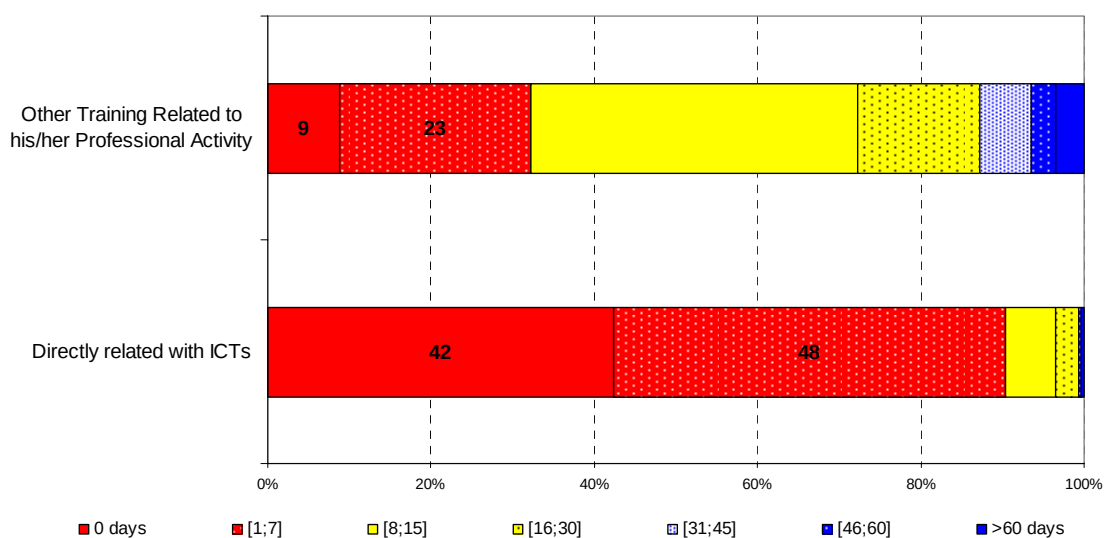


Figure 11: GPs training attendance and intensity (number of days)

The majority of GPs (52%) are Graduate Assistants. Broadly, the Assistant category comprises around 70% of total GPs inquired. The top category – Service Chief – comprises only 15% of the sample.

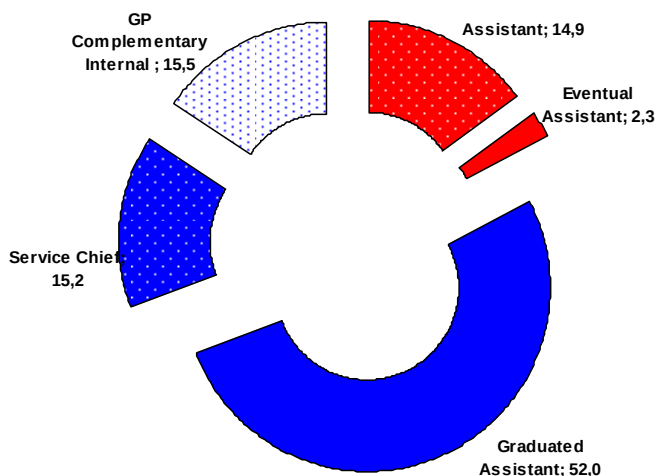


Figure 12: GPs distribution by professional category

Around half of the GPs have long term (effective/permanent) contracts and one quarter short-term ones ('Contratos Administrativos de Provimento').

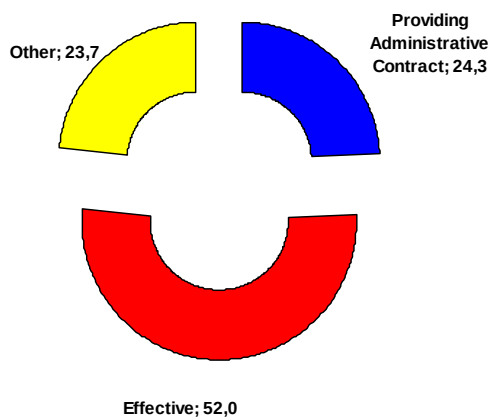


Figure 13: GPs distribution by type of labour contract

Over eighty per cent of Portuguese GPs work (exclusively or in partial time) in Health Centres – the vast majority of these dedicated fifty per cent or more of their working time to this workplace.

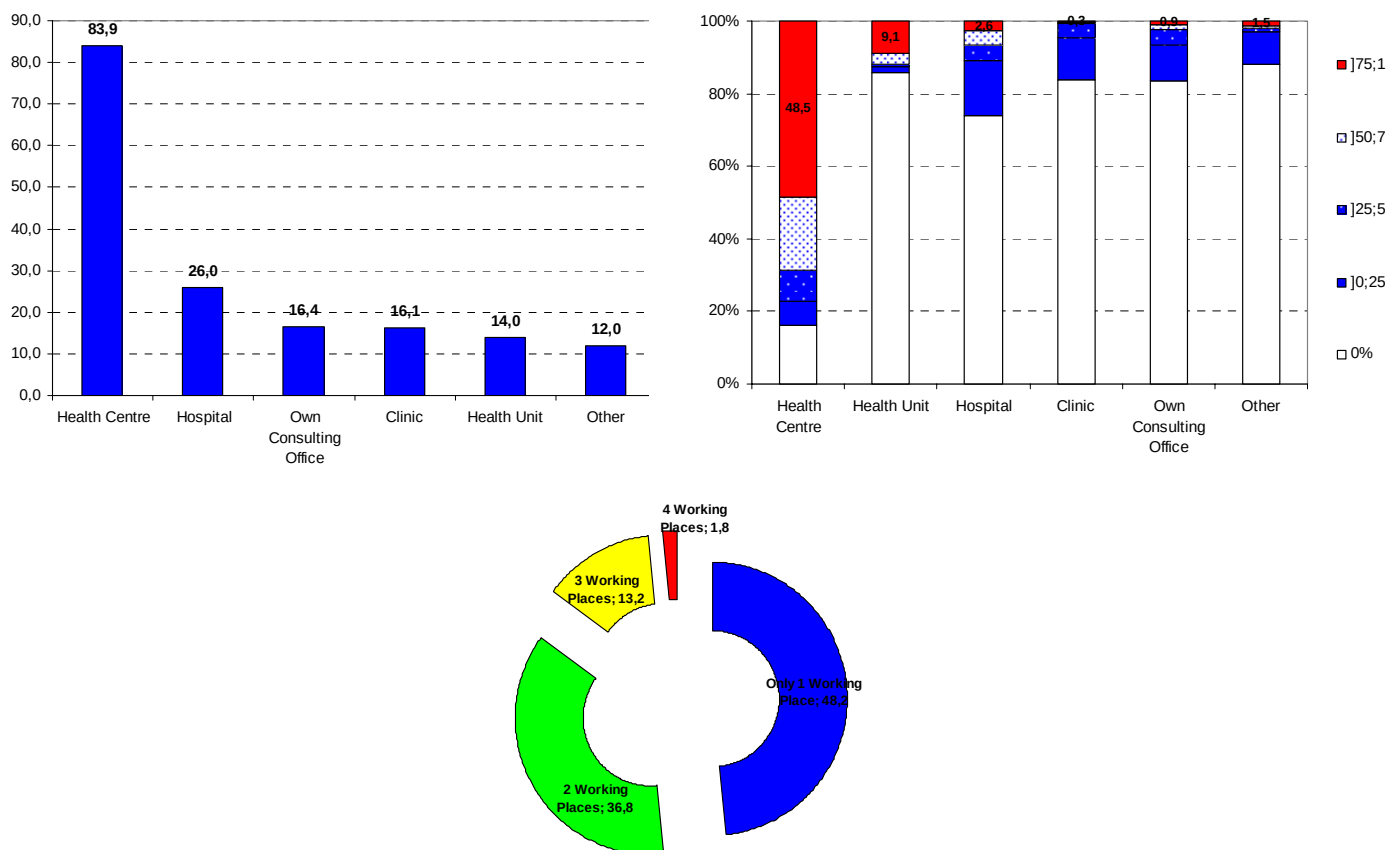


Figure 14: GPs distribution by type of workplace and time devoted to each type of workplace

A less expressive figure (28%) emerges in the case of Hospitals with a rather negligible percentage working there in a full time commitment.

It should be notice that the majority of GPs work in more than one place – 37% combine two workplaces, 13% three, and amazingly 2% manage to cope with 4 different workplaces. Such evidence cast serious doubts on the quality of services provided and the GPs availability to be enrolled in training activities targeting NITCs (but not only).

Our sample is strongly biased towards the North region. Around half of the respondent GPs work in the North region and ‘only’ 15% in Lisbon and Tagus Valley region. Mainland’s figures available in Martins et al. (2003) referred to 1999 evidence that similar percentages (around 1/3) of GPs work in these two regions. Similar conclusions are reached with IGIF’s data reported to 2004. For the other regions the sample is fairly representative. This over representativeness of the North regions is in large extent explained by our data gathering efforts, detailed in Section 3.2.

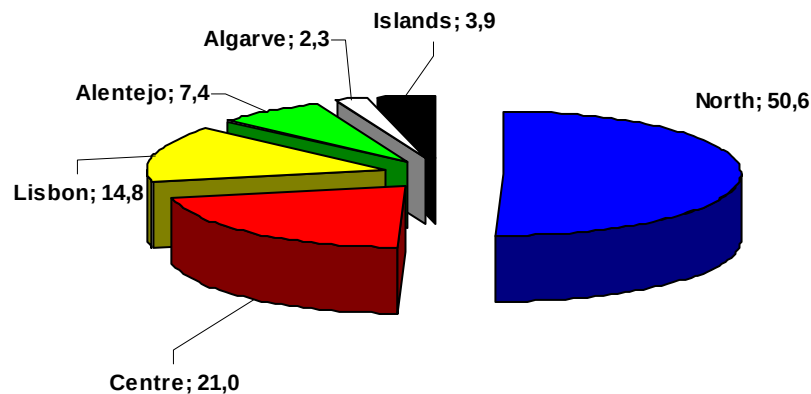


Figure 15: GPs distribution by region

3.4.2. Degree and intensity of usage of ICTs

According to the “Green Paper Living and Working in the Information Society: People First” (EC, 1996), the use of computers and computer-based patient records for primary care and in hospitals has increased quickly over the past 10 years in countries like the UK, where 90% of general practitioners (GPs) own a PC and 79% use electronic healthcare records, Denmark where 65% of GPs own PCs and use electronic health records, and the Netherlands where the numbers are 80% and 40% respectively while in other countries the progress was much slower. Great effort has been spent on standardisation of the electronic patient records and patients' smartcards in the Telematic Applications RTD Programme since the beginning of the 90s. As a result, communication between hospitals, general practitioners, laboratories has shown great improvement in quality of care, efficiency and cost effectiveness.

The eventual lack of use of ICTs cannot (in the present Portuguese GPs' sample) be attributed to the absence of physical means (computers). The vast majority of GPs possess computers with Internet access both at home (over 90%) and at the workplace (almost 70%). It is interesting to notice nevertheless that workplaces are relatively less equipped than GPs' houses.

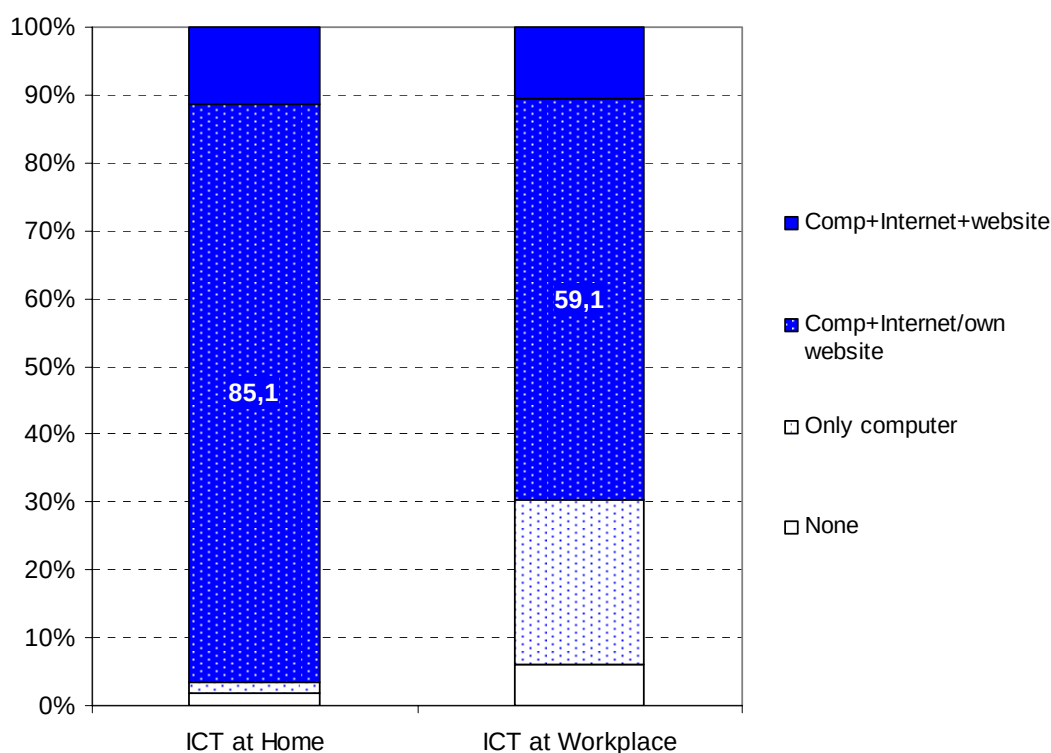


Figure 16: ICTs facilities at home and at the workplace

GPs tend to use Internet to a large extent for professional purposes rather than other. The noticeable exception is for the youngest age group (GPs aged 25-30 years old) who use the Internet in similar degree. It is interesting to note that GPs aged 50-60 years old spent, on average 12h/week (more than 2h per working day) in the Internet for professional purposes, whereas for those aged 30-40 years old the corresponding figure is 9h a week.

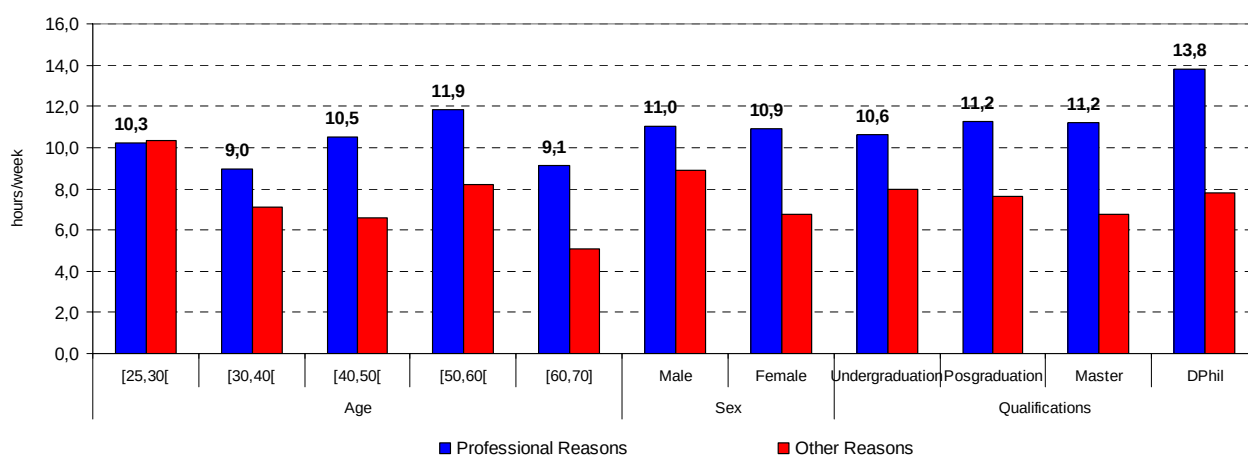


Figure 17: Weekly average hours of Internet usage for professional and other purposes, by age, gender and education

There seems to be no difference between genders in what respects Internet use for professional reasons – on average, male and female spent 11h/week in the Internet for these purposes.

There is a positive relation between the amount of hours spent in the Internet for professional reasons and the maximum level of formal education achieved –GPs with or enrolled in a PhD spent, on average, 3 hours a week more in the Internet than his/her colleague who has only the graduation course. Thus, at a first glance, to possess or to be enrolled in advanced training fosters the use of the Internet for professional purposes, which in its turn tends to grant individuals the access to more and up to date information and knowledge on these matters.

According to INE (2006) data, on the first trimester of 2006, 45,6% of the Portuguese families owned computers at home, even if the Internet and ADSL only represented 35,2% and 24% respectively. It further shows that, similar to GPs, consumers with higher educational levels are precisely the consumers who use the ICTs more frequently (with computers between 91% and with Internet 86,9%).

The majority (57%) of GPs agree (or totally) agree that the Internet is essential to their medical daily practice. That percentage, although below, is not very different from that observed for other European countries – 62%, according to Manhattan Research (2006).

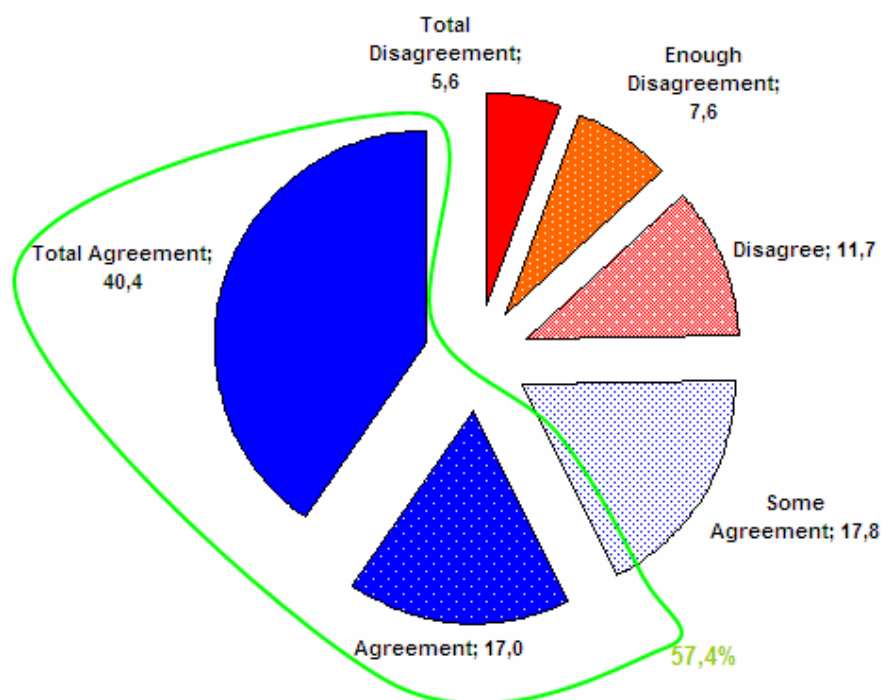


Figure 18: “The Internet is essential for my medical daily practice” – percentage of GPs by degree of agreement

Notwithstanding, there is a reasonable percentage (25%) that disagree with the above-referred statement, which in an Information Society paradigm that many argue we live in raises some concerns.

But what are the reasons for GPs use the Internet?

Corroborating the result above which associate the Internet use with the possession or enrolment in advanced training, Table 1 shows that the major motivation for using the Internet is to ‘Search information concerned with professional activity/investigation’. ‘Send and receiving email’ and ‘Search for information on goods and services’ are also important reasons that GPs justify for using the Internet.

According to UMIC (2003), the most widespread use of the Internet among the Portuguese population aged 15-65 years old is sending and receiving e-mails (76%), ten points below the figure obtained for GPs. This alludes to the role Internet gained in the social contacts dimension (either in a personal or in an institutional perspective). The same report (UMIC, 2003) observes that the other Internet uses are more self-oriented, being possible to identify different trends such as *leisure* (downloading music, games and videos, 54%; reading and downloading online newspapers and magazines, 43%; using chat sites, 33%), *comfort* (obtaining information from public authorities’ websites, 47%; searching information about goods and services, 42%; Internet banking, 28%) and *convenience* (work-related activities, 51%; study and learning activities, 49%). In these latter two activities, we observe that almost 70% of the respondent GPs claim to use often or always the Internet for searching information related to their professional activity, whereas the corresponding figure for developing activities of formal education is around 21% (although 60% claim to use the Internet for such purpose).

Table 1: Reasons for using the Internet [degree of use – 0 (no use) ... 5 (always), and percentage of GPs in that says ‘never’ and ‘often/always’]

		Average (0-5)	Never	Often/Always
Communication	Send/Receive e-mail	3,76	3,5	65,8
	Telephone via Internet/videoconference	0,86	60,5	7,6
	Develop a blog	0,29	85,7	2,3
	Other (access to chats, etc.)	1,40	43,9	14,0
	Average	1,58		
Search for Information and Use of on-line Services	Search information on goods and services	3,26	2,9	47,1
	Use of Services Related to Travels and Lodgements	2,63	12,0	33,6
	Listen Radio / Watch TV through Internet	1,04	50,9	7,6
	Play or Download Games, Images or Music	1,08	47,4	9,6
	Read / Download Journals / Magazines on-line	2,28	19,3	27,8
	Software Download (except Games, Images or Music)	1,49	36,0	14,0
	Search for a Job or Send Candidatures / CV	0,36	78,7	1,8
	Average	1,73		
Education / Training	Search Information concerned to his/her Professional Activity / Investigation	3,86	2,0	68,4
	Develop Activities of Formal Education (School, University, etc.)	1,73	40,1	20,8
	Perform Courses of Post-Formal Education (Out of the Official Educational System)	0,98	59,9	10,2
	Perform Courses Specifically Related to Job Opportunities	0,32	83,3	2,6
	Average	1,72		

Also noteworthy is the high percentage of Internet users among GPs recurring to Internet banking and visiting public authorities’ websites for obtaining information, namely for taxes purposes (IRS). This is seems to be in line with the Portuguese Government’s goal (UMIC, 2003) of the widespread diffusion of Internet usage aiming at simplifying the interaction between citizens and institutions, in particular public entities.

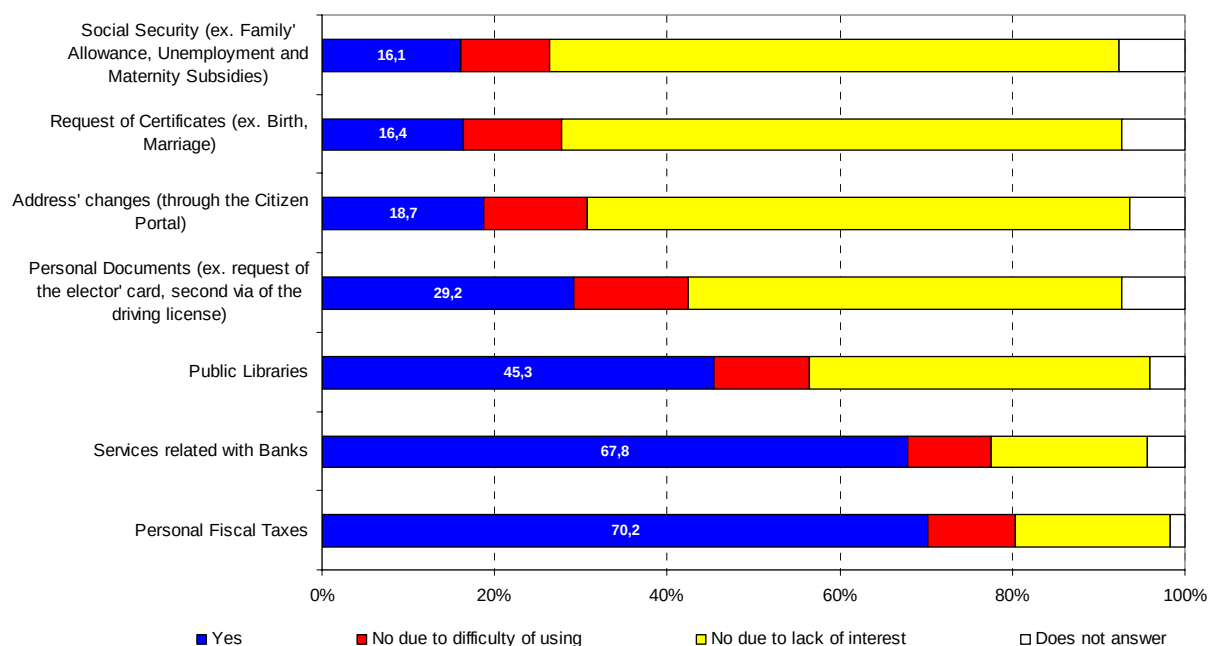


Figure 19: Use of the Internet for daily tasks (% of respondent GPs)

A substantial proportion of GPs (over 70 per cent) do not use the Internet or other related ICTs at their workplaces, namely for activities related with Telemedicine, exchanging files with other Hospitals/Health Units, external communication with citizens, training and consultation of provision catalogues. The most frequent activities for which GPs use the Internet are the search and gathering of information and access to databases.

Table 2: Activities performed at the workplace using ICTs/Internet

	Does not use	Uses Often/Always
Search and Gathering of Information / Documentation	27,8	38,3
Access to Data Bases	37,7	29,2
Internal Communication Between Services	48,2	21,1
Activities of Telemedicine	72,2	13,5
External Communication with Other Health Units	59,9	12,0
Exchange of Files with Other Hospital Units	76,6	6,1
External Communication with the Citizens	71,6	5,3
Training of Human Resources	76,3	3,2
Consultation of Provision Catalogues	81,0	2,0

The low use of telemedicine related activities is well depicted in the following graph.

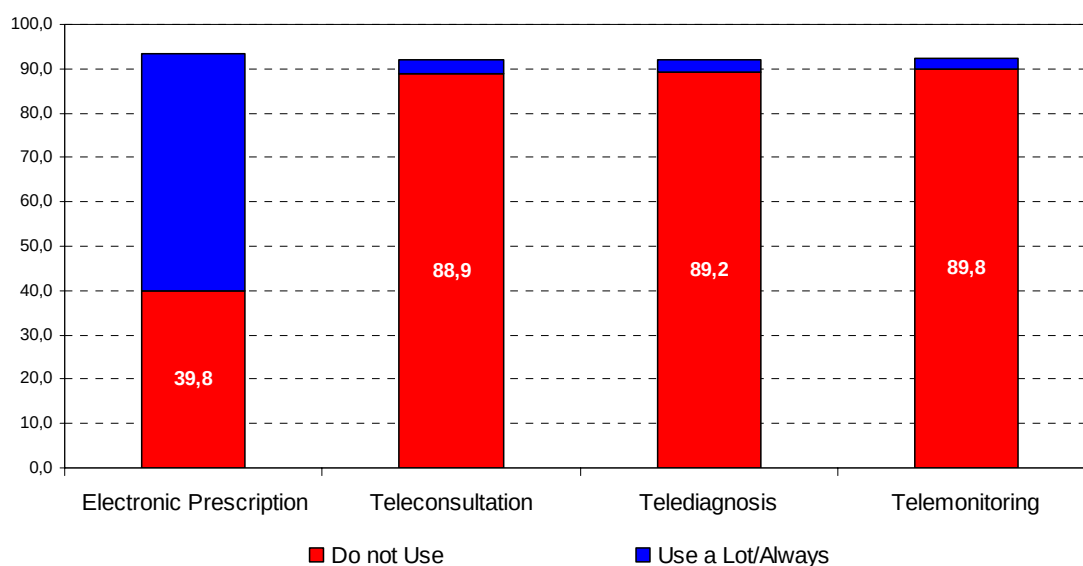


Figure 20: Telemedicine activities developed at the workplace (% of GPs)

Although Electronic Prescription is used by the roughly (60 per cent roughly) of the respondent GPs, for all the other activities – teleconsultation, telediagnosis, and telemonitoring – only a meagre percentage of physicians (around 10%) claim to use such technologies.

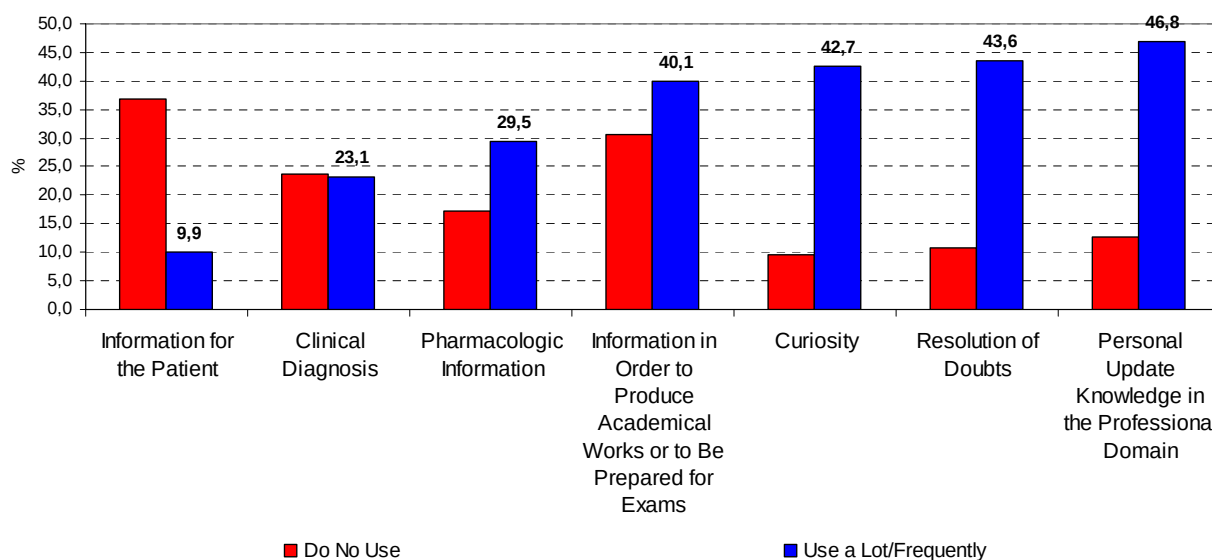


Figure 21: Use of the Internet for gathering information for daily medical practice

The most common purpose of using the Internet in the daily medical practice is for GPs updating their knowledge in the professional domain – in fact, 46,8% of the GPs surveyed claimed to use the Internet frequently or very frequently for those purposes (a small percentage, around 10%, admitted not doing so). The Internet is also extremely

used for queries and performance of academic related activities. In this vein, we might conclude that the Internet for the respondent GPs has a critical role on updating and improving their professional knowledge basis.

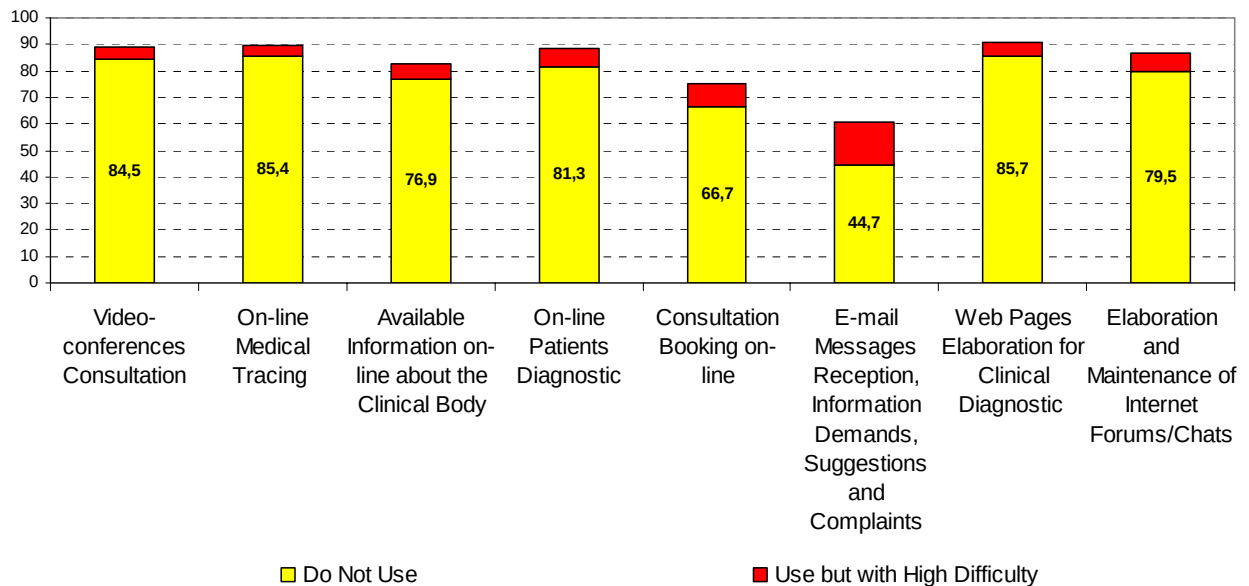


Figure 22: Use and degree of difficulty in using ICTs related activities

Notwithstanding the importance of the Internet for information and knowledge up date and upgrading, excluding emails, for the remaining activities listed in Figure 21 – web pages (86%), video conferences (85%), on line medical tracing (85%), on line patient diagnosis (81%), chats/forums (80%) - a huge percentage of GPs (over $\frac{3}{4}$) admit not using them. Moreover, despite a considerable proportion of GPs that claimed to use emails, a non-negligible part of these latter consider that they face severe or considerable difficulties in performing such activity. We might speculate that the low percentage of GPs that claim to face difficulties in activities that are manifestly more complex than email management (e.g., construction of web pages), derives from the fact that those few that use them are the ones that have already a good expertise in ICT-related activities.

3.4.3. Sources of Information for medical daily practice and knowledge updating

As we referred above, the respondent GPs consider ICT related technologies, in particular the Internet, as important vehicles for knowledge up dating and up grading. It is important to uncover which are the main sources of information that help GPs to pursue their demanding daily practice.

The three most important scientific sources of information for Portuguese GPs are *Revista Portuguesa de Clínica Geral*, scientific and technical books, *Jornal Médico de Família*, and *American Family Physician*.

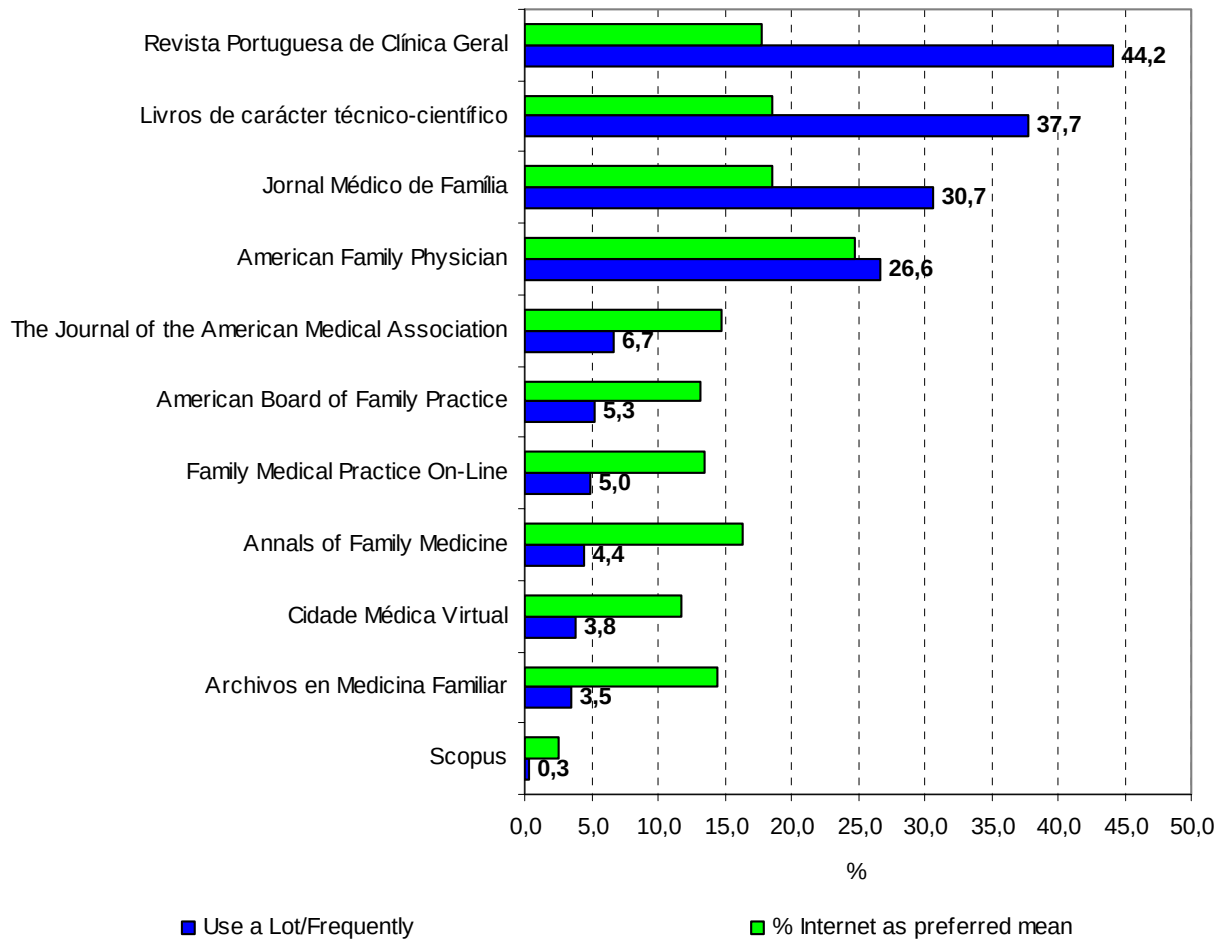


Figure 23: Most important sources of information for GPs' daily medical practice – scientific journals and books

Less than 20% reckon that the Internet is the preferred way/mean of reading the above-referred journals/books. This could indicate that printing materials would be the preferred mean for GPs getting their information for knowledge up grading and updating. This however does not seem to be the case. In fact, when asked about the degree of importance attributed to a set of ways of upgrading complementing their knowledge (see Figure 24), the 'reading and searching on the Internet' was the item that collected the highest percentage of Portuguese GPs claiming that it was a very important source of upgrading knowledge.

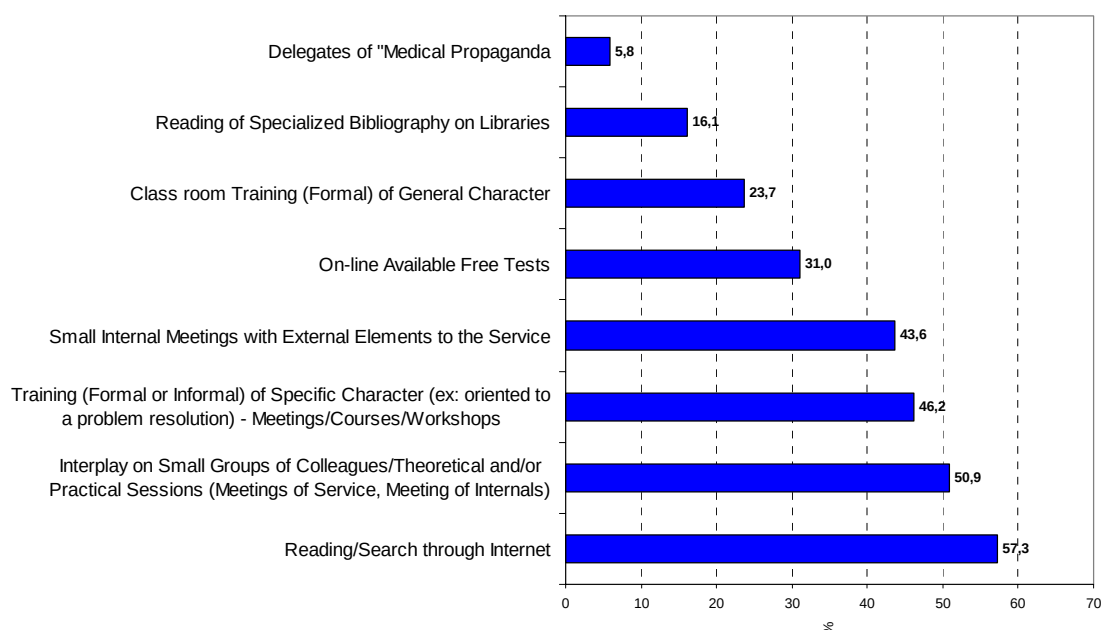


Figure 24: Ways of upgrading/complementing knowledge (% of GPs that answered 'important' and 'very important')

It is surprising the low percentage (less than 7%) that consider 'Delegados da Propaganda Médica', or the more recent label 'Delegados de Informação Médica' (Medical Information Delegates), an important or very important source of information and knowledge for their daily medical practice. In fact, and according to Granja (2005), the frequency at which Portuguese physicians (especially family physicians) contact with pharmaceutical sales representatives is higher than the frequency reported in countries where studies are available (namely, Canada and the United States of America). So one would expect that these professionals would be an important source of information and knowledge (namely in pharmaceutical related issues) for GPs' daily medical practice.

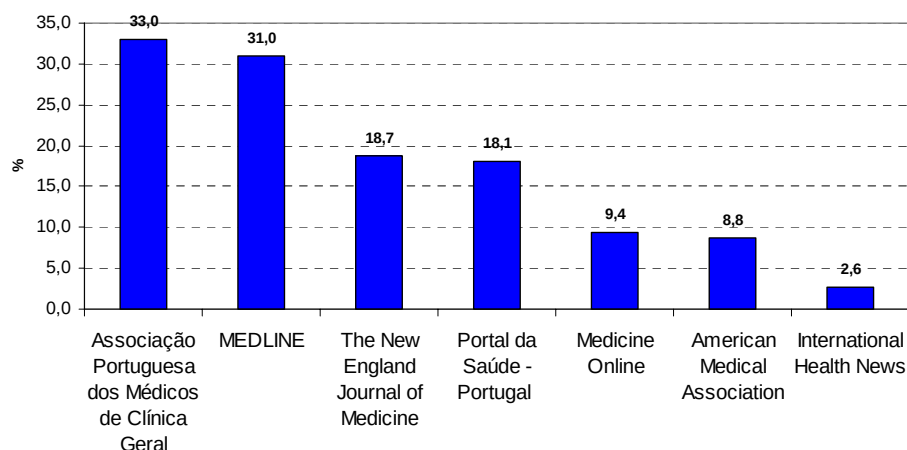


Figure 25: Most important sources of information for GPs' daily medical practice – web pages

The most important web pages, in terms of frequency of use, are Associação Portuguesa dos Médicos de Clínica Geral and Medline, with one third of GPs claiming that they consult these pages a lot, followed by *The New England Journal of Medicine* and *Portal da Saúde – Portugal*, with corresponding percentages of 18%.

Only 10% of Portuguese GPs agree that the “The ICTs contribute for an increasing obsolescence of GPs' knowledge base” – 70% absolutely disagree with such statement which means that for these GPs ICTs, in particular the Internet, is seen as a vehicle for knowledge upgrading and updating.

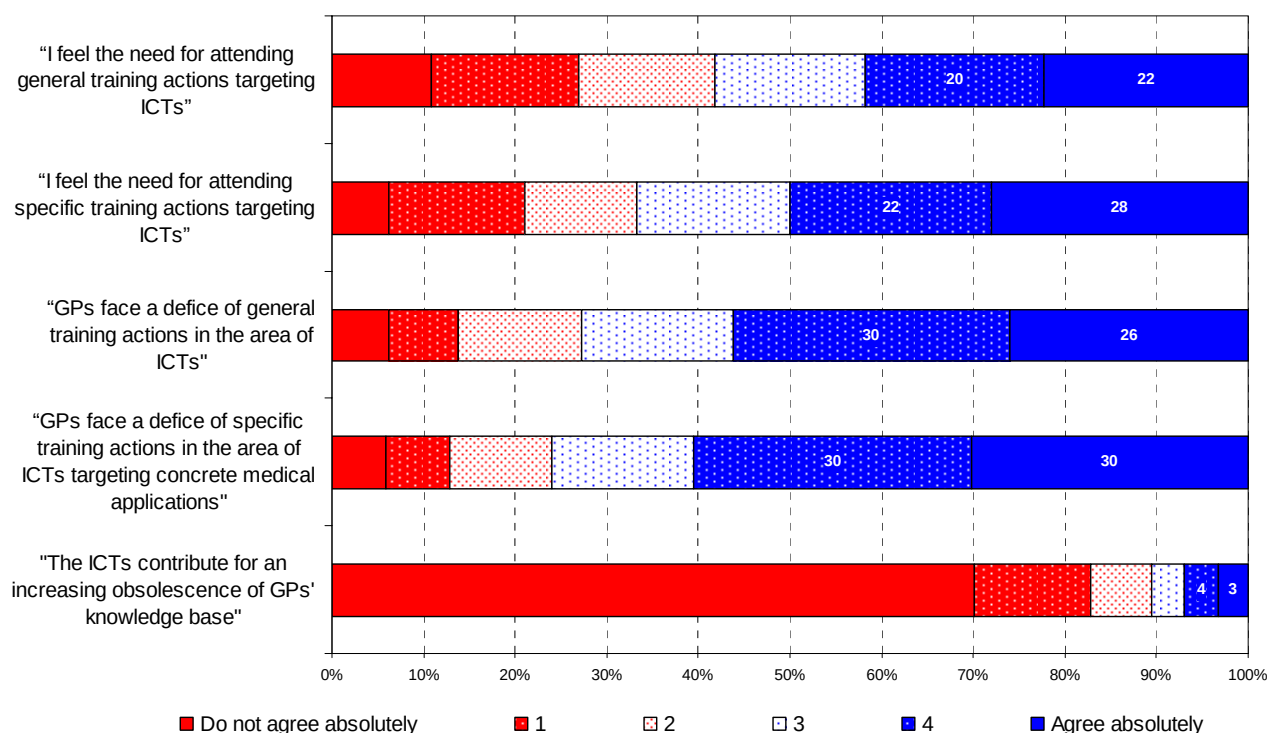


Figure 26: Degree of Agreement with the Statements (% of GPs)

The Portuguese GPs nevertheless recognise that the vast majority of GPs lack specific and general training on ICTs related technologies and 50% agree (22%) or absolutely agree (28%) that they need to attend specific training actions on ICTs. As we evidenced earlier, a large percentage (42%) of GPs admitted that in the last year (2006) they did not take any professional training targeting ICTs. Those that did undertook rather short-term (less than one week) courses. Such a disheartening scenario uncovers an effective risk of a large part of Portuguese GPs been unable to reap the benefits of ICTs in general, and the Internet in particular.

3.4.4. Statistical assessment of the differences in means concerning GPs Internet use, medical and scientific performance

In order to provide a general, although simple, overview of the descriptive statistics of the relevant variables and whether their means significantly differ in statistical terms in some perspectives – opinion on the Internet utility, Internet use, medical and scientific practice performance of GPs – we compute and analyse non-parametric independent group comparisons using the Kruskal-Wallis Test. This is a simple and useful non-parametric test (distribution-free) used to compare two or more independent groups of sampled data.²¹ The hypotheses for the comparison of two independent groups are:

H_0 : The samples come from identical populations

H_1 : The samples come from different populations

It should be notice that the hypothesis makes no assumptions about the distribution of the populations. These hypotheses are also sometimes written as testing the equality of the central tendency of the populations.

The test statistic for the Kruskal-Wallis test is H . This value is compared to a table of critical values for U based on the sample size of each group. If H exceeds the critical value for H at some significance level (usually 0.10) it means that there is evidence to reject the null hypothesis in favour of the alternative hypothesis.

When sample sizes are small in each group (< 5) and the number of groups is less than 4 a tabled value for the Kruskal-Wallis should be compared to the H statistic to determine the significance level. Otherwise, as in our case (see Tables 3-6), a Chi-square with $k-1$ (the number of groups-1) degrees of freedom can be used to approximate the significance level for the test.

When the asymptotic significance is less than 0.10 (indicate with grey areas), we reject the H_0 that the samples are identical for the item in analysis.

²¹ Unlike the parametric independent group ANOVA (one way ANOVA), this non-parametric test makes no assumptions about the distribution of the data (e.g., normality). Thus, this test is an alternative to the independent group ANOVA, when the assumption of normality or equality of variance is not met. This, like many non-parametric tests, uses the ranks of the data rather than their raw values to calculate the statistic. Since this test does not make a distributional assumption, it is not as powerful as the ANOVA.

Given the aim of the present dissertation, we analyse four groups of variables:

- 1) GPs that agree with statement “The Internet is essential for my daily medical practice” versus those that don’t agree with it;
- 2) GPs that use the Internet for medical practice above the average versus the remaining GPs;
- 3) GPs that present a medical daily practice performance above the average versus the remaining GPs;
- 4) GPs that present a scientific performance above the average versus the remaining.

The grouping variables were computed based on the responses gathered in our survey. Concerning the first variable – ‘agree that the Internet is essential’ – we compute a dummy variable that assumes the value 1 when GPs responded 4 (agree a lot) or 5 (agree absolutely) and 0 otherwise.

The second variable – use Internet for medical practice above the average – is also a dummy variable that assumes the value 1 when the index, computed as the sum of the degree of use (0 - no use; ...; 5 - use always) of activities listed in Question 11 of the questionnaire (see Appendix), is above the average and 0 otherwise.

Medical daily practice is a dummy variable computed as an index which sums up three indexes - number of consultations, number of prescriptions, and number of hours spent in bureaucratic/managerial work related with the health unit; again if the index is above the average, the dummy variable assumes the value 1 and 0 otherwise.

Finally, Scientific performance is computed in a similar, albeit more complex, way. It averages two indicators of performance ($0,3 \times Perf_Conf + 0,7 \times Perf_Journals$), one related with the scientific performance associated with congresses/conferences ($0,1 \times n^{\circ} \text{ talks} + 0,3 \times n^{\circ} \text{ papers at national conferences} + 0,6 \times n^{\circ} \text{ papers at international conferences}$) and other related with publications in scientific journals ($0,4 \times n^{\circ} \text{ publications at national journals} + 0,6 \times n^{\circ} \text{ publications at international journals}$); the dummy assumes once more the value 1 for GPs that present the index with a figure above the corresponding mean and 0 otherwise.

Comparing the group of GPs that argues that “Internet is essential for their daily medical practice” with those who don’t (Table 3), Kruskal Wallis Test indicates that

they are younger, tend to work, to a large extent, at hospitals, use the Internet more intensively, admit to experience difficulties using ICT related technologies in a higher degree, had longer periods of ICT related training, present lower medical daily practice performance, and higher scientific performance.

Concerning the group of GPs that “use the Internet (above the average) for daily medical practice” versus those that present below average values (Table 4), the former tend to work in a narrower set of workplaces, reckon that the Internet is an essential tool for their daily medical practice, and present a higher global scientific performance.

Those GPs that present an above the average medical performance are older, present an above the average Internet use, and lower scientific performance (Table 5). It seems apparent that daily medical practice and scientific activities are, in the case of Portuguese GPs not complementary tasks.

In fact, above average scientific performance GPs present lower daily medical practice (Table 6), are younger, attained higher education levels, present a higher use of ICTs related to activities (excluding developing a blog, and listen radio/seeing TV in the Internet) and consider that the Internet is essential.

Given the above results, obtained by simple descriptive statistical analysis, it would be pertinent to assess in a more comprehensive and holistic fashion, which are the determinants, that is, the underlying explanatory factors, of Portuguese GPs’ perception on the importance of the Internet for their daily medical practice, and the determinants of their effective use of the Internet.

In concrete, we want to evaluate to what extent this perception and use is dependent upon GPs demographic characteristics (age, gender), education attained, professional category (assistants, chief service), type of labour contract and workplace (Health Centre, Hospitals), and region (North, Centre, ...) where they perform their activity.

Moreover, we would like to assess the importance of previous ICT related training and GPs profile – medical daily practice versus scientific – on GPs use and perception of the Internet.

For pursuing such intents, in the next section we propose and estimate an econometric model of GPs Internet perception and GPs Internet use.

Table 3: Agrees that "the Internet is essential for medical daily practice" – Kruskal Wallis Test

		Agrees that "the Internet is essential for medical daily practice"		All	Chi-Square	Asymp. Sig.
		No	Yes			
Structural variables	Age	3,514	3,036	3,240	12,851	0,000
	Education	1,527	1,495	1,509	0,108	0,743
	Number of workplaces	1,712	1,663	1,684	0,124	0,725
	Hospital	0,212	0,296	0,260	3,028	0,082
Internet use	Number of hours/week (above the average) using the Internet	0,178	0,383	0,295	16,777	0,000
	Send/receiving email	3,096	4,255	3,760	53,986	0,000
	Telephone via Internet	0,541	1,092	0,857	13,889	0,000
	Developing a blog	0,089	0,439	0,289	16,695	0,000
	Search information on goods and services	2,705	3,679	3,263	42,424	0,000
	Using travel and accommodation services	1,979	3,107	2,626	41,133	0,000
	Listen radio and seeing TV on the Internet	0,596	1,372	1,041	27,111	0,000
	Playing and downloading games, images and music	0,801	1,281	1,076	12,376	0,000
	Reading and downloading journals online	1,651	2,750	2,281	37,385	0,000
	Downloading software (excluding games, images and music)	0,966	1,872	1,485	35,504	0,000
	Look for employment/sending applications, CVs	0,158	0,515	0,363	17,473	0,000
	Search for subjects related to scientific and professional activities	3,151	4,393	3,863	76,563	0,000
	Developing activities of formal education (school, university, etc.)	1,171	2,148	1,731	20,226	0,000
	Courses of education extra formal education (outside the official system)	0,466	1,367	0,982	24,170	0,000
	Courses related specifically with job opportunities	0,116	0,474	0,322	13,939	0,000
	Telemedicine activities	0,623	1,102	0,898	7,246	0,007
	Change files with other hospital units	0,356	0,791	0,605	4,328	0,037
	External communication with citizens	0,356	0,827	0,626	14,399	0,000
	External communication with other health units	0,808	1,291	1,085	7,725	0,005
	Internal communication between services	1,171	1,781	1,520	8,595	0,003
	Human resources training	0,329	0,694	0,538	8,289	0,004
	Consultation of provision catalogues	0,226	0,500	0,383	9,131	0,003
	Database access	1,377	2,439	1,985	24,143	0,000
	Search and gathering of information/documents	1,671	3,082	2,480	44,921	0,000
Difficulty in performing these activities	Consultation by video conference	0,507	0,347	0,415	0,006	0,938
	Online medical tracing	0,404	0,352	0,374	0,331	0,565
	Online information available about medical issues	0,500	0,587	0,550	2,451	0,117
	Online diagnosis	0,459	0,541	0,506	2,491	0,115
	Register online consultations	0,589	0,929	0,784	8,960	0,003
	Reception of email, information request, suggestions, complains	0,979	1,628	1,351	13,537	0,000
	Making web pages for medical diagnosis	0,336	0,454	0,404	4,028	0,045
	Maintenance of forums/chats in the Internet	0,418	0,643	0,547	7,449	0,006
Opinion	"The Internet is essential to my medical daily practice"	1,979	4,704	3,541	271,593	0,000
Training	Number of days of ICT related training	2,983	4,258	3,713	5,078	0,024
Performance	Medical daily practice	95,864	81,139	87,425	4,335	0,037
	Global scientific performance	0,186	0,347	0,278	27,337	0,000

Table 4: Use of the Internet (above the average) for medical practice – Kruskal Wallis Test

		Use of the Internet (above the average) for medical practice		All	Chi-Square	Asymp. Sig.
		No	Yes			
Structural variables	Age	3,294	3,166	3,240	1,142	0,285
	Education	1,497	1,524	1,509	0,082	0,775
	Number of workplaces	1,751	1,593	1,684	2,871	0,090
	Hospital	0,249	0,276	0,260	0,318	0,573
Internet use	Number of hours/week (above the average) using the Internet	0,213	0,407	0,295	15,014	0,000
	Send/receiving email	3,315	4,366	3,760	47,436	0,000
	Telephone via Internet	0,726	1,034	0,857	4,997	0,025
	Developing a blog	0,223	0,379	0,289	3,793	0,051
	Search information on goods and services	3,015	3,600	3,263	15,648	0,000
	Using travel and accommodation services	2,350	3,000	2,626	13,656	0,000
	Listen radio and seeing TV on the Internet	0,939	1,179	1,041	5,412	0,020
	Playing and downloading games, images and music	0,919	1,290	1,076	11,337	0,001
	Reading and downloading journals online	1,914	2,779	2,281	23,669	0,000
	Downloading software (excluding games, images and music)	1,223	1,841	1,485	16,719	0,000
	Looking for employment or sending applications, CVs	0,315	0,428	0,363	1,867	0,172
	Search for subjects related to scientific and professional activities	3,477	4,386	3,863	40,916	0,000
	Developing activities of formal education (school, university, etc.)	1,355	2,241	1,731	19,039	0,000
	Courses of education extra formal education (outside the official system)	0,675	1,400	0,982	21,564	0,000
	Courses related specifically with job opportunities	0,249	0,421	0,322	9,631	0,002
	Telemedicine activities	0,289	1,724	0,898	61,819	0,000
	Change files with other hospital units	0,071	1,331	0,605	90,599	0,000
	External communication with citizens	0,122	1,310	0,626	87,159	0,000
	External communication with other health units	0,264	2,200	1,085	131,233	0,000
	Internal communication between services	0,472	2,945	1,520	144,774	0,000
	Human resources training	0,112	1,117	0,538	76,906	0,000
	Consultation of provision catalogues	0,051	0,834	0,383	72,802	0,000
	Database access	0,893	3,469	1,985	152,543	0,000
	Search and gathering of information/documents	1,437	3,897	2,480	136,130	0,000
	Consultation by video conference	0,355	0,497	0,415	5,653	0,017
	Online medical tracing	0,294	0,483	0,374	8,466	0,004
	Online information available about medical issues	0,335	0,841	0,550	27,008	0,000
	Online diagnosis	0,426	0,614	0,506	7,865	0,005
	Register online consultations	0,569	1,076	0,784	25,129	0,000
	Reception of email, information request, suggestions, complains	1,036	1,779	1,351	25,182	0,000
	Making web pages for medical diagnosis	0,264	0,593	0,404	8,363	0,004
	Making and maintaining forums/chats in the Internet	0,315	0,862	0,547	26,113	0,000

Table 5: Medical Performance above the average – Kruskal Wallis Test

		Medical Performance above the average		All	Chi- Square	Asymp. Sig.
		No	Yes			
Structural variables	Age	3,092	3,467	3,240	8,337	0,004
	Education	1,454	1,593	1,509	2,215	0,137
	Number of workplaces	1,643	1,748	1,684	1,182	0,277
	Hospital	0,271	0,244	0,260	0,288	0,592
Internet use	Number of hours/week (above the average) using the Internet	0,256	0,356	0,295	3,877	0,049
	Send/receiving email	3,986	3,415	3,760	11,491	0,001
	Telephone via Internet	0,860	0,852	0,857	0,025	0,875
	Developing a blog	0,319	0,244	0,289	1,178	0,278
	Search information on goods and services	3,367	3,104	3,263	2,881	0,090
	Using travel and accomodation services	2,744	2,444	2,626	2,803	0,094
	Listen radio and seeing TV on the Internet	1,034	1,052	1,041	0,009	0,924
	Playing and downloading games, images and music	1,121	1,007	1,076	2,101	0,147
	Reading and downloading journals online	2,401	2,096	2,281	3,137	0,077
	Downloading software (excluding games, images and musics)	1,560	1,370	1,485	2,151	0,142
	Looking for employment/sending applications	0,411	0,289	0,363	1,120	0,290
	Search for subjects related to scientific and professional activities	4,000	3,652	3,863	7,134	0,008
	Developing activities of formal education (school, university, etc.)	1,802	1,622	1,731	0,741	0,389
	Courses of education extra formal education (outside the official system)	1,048	0,881	0,982	0,414	0,520
	Courses related specifically with job opportunities	0,377	0,237	0,322	0,032	0,858
	Telemedicine activities	0,952	0,815	0,898	1,357	0,244
	Change files with other hospital units	0,662	0,519	0,605	0,679	0,410
	External communication with citizens	0,638	0,607	0,626	0,560	0,454
	External communication with other health units	1,135	1,007	1,085	0,379	0,538
	Internal communication between services	1,517	1,526	1,520	0,004	0,952
Activities developed at the workplace	Human resources training	0,473	0,637	0,538	2,210	0,137
	Consultation of provision catalogues	0,386	0,378	0,383	0,073	0,787
	Database access	2,068	1,859	1,985	0,580	0,446
	Search and gathering of information/documents	2,512	2,430	2,480	0,124	0,725
	Consultation by video conference	0,367	0,489	0,415	0,444	0,505
	Online medical tracing	0,285	0,511	0,374	1,367	0,242
	Online information available about medical issues	0,498	0,630	0,550	0,969	0,325
	Online diagnosis	0,488	0,533	0,506	0,071	0,790
	Register online consultations	0,749	0,837	0,784	0,289	0,591
	Reception of email, information request, suggestions, complains	1,353	1,348	1,351	0,056	0,813
Difficulty in performing these activities	Making web pages for medical diagnosis	0,377	0,444	0,404	1,155	0,283
	Maintaining forums/chats in the Internet	0,502	0,615	0,547	0,774	0,379
	"The Internet is essential to my medical daily practice"	3,618	3,422	3,541	1,151	0,283
	Number of days of ICT related training	3,862	3,485	3,713	0,001	0,972
Performance	Medical daily practice	54,587	137,776	87,425	238,010	0,000
	Global scientific performance	0,307	0,234	0,278	18,532	0,000

Table 6: Scientific Performance above the average – Kruskal Wallis Test

		Scientific Performance above the average		All	Chi- Square	Asymp. Sig.
		No	Yes			
Structural variables	Age	3,371	2,831	3,240	16,652	0,000
	Education	1,436	1,735	1,509	13,300	0,000
	Number of workplaces	1,699	1,639	1,684	0,244	0,621
	Hospital	0,251	0,289	0,260	0,475	0,491
Internet use	Number of hours/week (above the average) using the Internet	0,274	0,361	0,295	2,296	0,130
	Send/receiving email	3,560	4,386	3,760	19,561	0,000
	Telephone via Internet	0,757	1,169	0,857	5,657	0,017
	Developing a blog	0,290	0,289	0,289	0,079	0,778
	Search information on goods and services	3,158	3,590	3,263	5,729	0,017
	Using travel and accommodation services	2,417	3,277	2,626	17,479	0,000
	Listen radio and seeing TV on the Internet	0,988	1,205	1,041	1,893	0,169
	Playing and downloading games, images and music	0,950	1,470	1,076	11,758	0,001
	Reading and downloading journals online	2,116	2,795	2,281	10,677	0,001
	Downloading software (excluding games, images and music)	1,336	1,952	1,485	11,335	0,001
	Looking for employment or sending applications, CVs	0,320	0,494	0,363	2,726	0,099
	Search for subjects related to scientific and professional activities	3,672	4,458	3,863	24,830	0,000
	Developing activities of formal education (school, university, etc.)	1,421	2,699	1,731	29,514	0,000
	Courses of education extra formal education (outside the official system)	0,764	1,663	0,982	24,288	0,000
	Courses related specifically with job opportunities	0,243	0,566	0,322	4,953	0,026
	Telemedicine activities	0,764	1,313	0,898	9,155	0,002
	Change files with other hospital units	0,490	0,964	0,605	11,788	0,001
	External communication with citizens	0,432	1,229	0,626	17,241	0,000
	External communication with other health units	0,992	1,373	1,085	1,913	0,167
	Internal communication between services	1,317	2,157	1,520	10,374	0,001
Activities developed at the workplace	Human resources training	0,340	1,157	0,538	35,316	0,000
	Consultation of provision catalogues	0,293	0,663	0,383	9,337	0,002
	Database access	1,776	2,639	1,985	12,719	0,000
	Search and gathering of information/documents	2,278	3,108	2,480	11,524	0,001
	Consultation by video conference	0,394	0,482	0,415	2,774	0,096
	Online medical tracing	0,386	0,337	0,374	0,734	0,392
	Online information about medical issues	0,510	0,675	0,550	3,725	0,054
	Online diagnosis	0,479	0,590	0,506	3,471	0,062
	Register online consultations	0,799	0,735	0,784	1,211	0,271
	Reception of email, information request, suggestions, complains	1,359	1,325	1,351	0,413	0,521
Difficulty in performing these activities	Making web pages for medical diagnosis	0,386	0,458	0,404	2,748	0,097
	Maintaining forums/chats in the Internet	0,452	0,843	0,547	14,647	0,000
Opinion	"The Internet is essential to my medical daily practice"	3,347	4,145	3,541	15,809	0,000
Training	Number of days of ICT related training	3,797	3,452	3,713	0,134	0,715
Performance	Medical daily practice	91,600	74,396	87,425	4,748	0,029
	Global scientific performance	0,050	0,992	0,278	203,743	0,000

3.5. The use of the ICTs and General Physicians' human capital profile. Results from an econometric model

The aim here is to assess which are the main determinants of the propensity to use the Internet by Portuguese GPs and their perception or opinion of the usefulness of the Internet. The nature of the data observed regarding the dependent variable [‘To use the Internet above the average’ (dummy=1 if yes), or ‘To acknowledge, above the average, that the Internet is essential for medical daily practice’ (dummy= (1) if Yes; (0) No)] dictates the choice of the estimation model. Conventional estimation techniques (e.g., multiple regression analysis), in the context of a discrete dependent variable, are not a valid option. Firstly, the assumptions needed for hypothesis testing in conventional regression analysis are necessarily violated – it is unreasonable to assume, for instance, that the distribution of errors is normal. Secondly, in multiple regression analysis predicted values cannot be interpreted as probabilities – they are not constrained to fall in the interval between 0 and 1.²² The approach used, therefore, is to analyse each situation in the general framework of probabilistic models.

In the model of ‘Internet use propensity’, it is believed (*cf.* sub-section 3.4) that a set of factors, such as GPs demographic characteristics (age, gender), maximum education attained (licence (graduation), postgraduation, master (MSc), PhD), professional category (Internships, assistants, graduate assistants, service chief), type of labour contract and workplace (Health Centre, Hospitals), region (North, Centre, ...) where GPs perform their activity, previous ICT related training, and GPs profile – medical daily practice versus scientific –, are likely to influence GPs Internet use and perception. These ‘explanatory’ variables are gathered in a vector X , which explain the outcome, so that

$$\text{Prob}(Y = 1) = F(X, \beta) \quad \text{and} \quad \text{Prob}(Y = 0) = 1 - F(X, \beta).$$

The set of parameters β reflects the impact of changes in X on the likelihood of ‘using the Internet’.

The empirical assessment of the propensity to use the Internet is based on the estimation of the following general logistic regression:

²² The logistic regression model is also preferred to another conventional estimation technique, discriminant analysis. According to Hosmer and Lemeshow (1989), even when assumptions required for discriminant analysis are satisfied, logistic regression still performs well.

$$P(\text{Use Internet}) = \frac{1}{1 + e^{-Z}};$$

$$\text{with } Z = \beta_0 + \beta_1 \mathbf{Age} + \beta_2 \mathbf{Gender} + \beta_3 \mathbf{Education} + \beta_4 \mathbf{ProfCategory} +$$

$$+ \beta_5 \mathbf{Contract} + \beta_6 \mathbf{Workplace} + \beta_7 \mathbf{Region} + \beta_8 \mathbf{Training} + \beta_9 \mathbf{Profile} + \varepsilon_i$$

In order to have a more straightforward interpretation of the logistic coefficients, the logistic model can be rewritten in terms of the odds of an event occurring - the *logit* model comes:

$$\log\left(\frac{\text{Pr ob}(u \text{ sin } g)}{\text{Pr ob}(not \text{ u sin } g)}\right) = \beta_0 + \beta_1 \mathbf{Age} + \beta_2 \mathbf{Gender} + \beta_3 \mathbf{Education} + \beta_4 \mathbf{ProfCategory} +$$

$$+ \beta_5 \mathbf{Contract} + \beta_6 \mathbf{Workplace} + \beta_7 \mathbf{Region} + \beta_8 \mathbf{Training} + \beta_9 \mathbf{Profile} + \varepsilon_i$$

The logistic coefficient can be interpreted as the change in the log odds associated with a one-unit change in the independent variable. Then e raised to the power β_i is the factor by which the odds change when the i^{th} independent variable increases by one unit. If β_i is positive, this factor will be greater than 1, which means that the odds are increased; if β_i is negative, the factor will be less than one, which means that the odds are decreased. When β_i is 0, the factor equals 1, which leaves the odds unchanged.

We estimated four models, the first three corresponding to different proxies for measuring the Use of the Internet by the Portuguese GPs – Hours spent in the Internet; Use the Internet for medical daily practice; Degree of global use of the Internet. All these (dependent) variables were taken here as dummy variables (assuming 1 for above the average values and 0 otherwise). As referred in the previous section, the ‘use Internet for medical practice’ is an index, computed as the sum of the degree of use (0 - no use; ...; 5 - use always) of activities listed in Question 11 of the questionnaire (see Appendix). The ‘degree of global use of the Internet’ is an index computed as the average of five variables which try to assess different perspectives of the use of the Internet: communication, general information search, education improvement, professional purposes, and medical information search. The first three of these variables were computed summing up the values corresponding to each of the items listed in Question 9 of the Questionnaire (see Appendix), whereas the last two, sum up the corresponding values of questions 11 and 16 of the same questionnaire.

Table 7: Descriptive statistics and correlation matrix

		Mean	σ	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Internet use	(1) Hours spent in the Internet for professional purposes	0,295	0,457	1,00	0,21	0,16	0,22	-0,06	0,00	0,08	-0,03	0,01	0,12	0,12	-0,09	0,06	0,07	-0,01	0,01	-0,12	0,19	0,00	0,17
	(2) Use of the Internet for daily medical practice	0,424	0,495		1,00	0,48	0,26	0,04	-0,01	-0,04	-0,02	-0,01	0,04	-0,01	-0,02	-0,09	0,10	-0,01	-0,08	0,08	0,23	-0,04	0,24
	(3) Degree of global Internet use	0,491	0,501			1,00	0,38	0,18	-0,14	-0,12	0,04	-0,05	0,17	0,04	0,05	-0,24	-0,01	-0,18	-0,12	0,09	0,11	-0,12	0,28
Internet perception	(4) 'Internet is essential for daily medical practice'	0,573	0,495				1,00	0,09	-0,07	-0,13	0,09	0,04	0,11	-0,13	-0,06	-0,05	-0,13	-0,12	-0,07	0,09	0,12	-0,10	0,18
Age	(5) [30; 40[	0,108	0,311					1,00	-0,20	-0,37	0,12	0,01	-0,05	0,01	0,46	-0,34	-0,15	-0,16	-0,07	0,06	0,01	-0,02	0,23
	(6) [40; 50[	0,254	0,436						1,00	-0,62	0,07	0,08	0,04	-0,07	0,04	0,24	-0,14	0,08	-0,03	-0,10	-0,09	0,01	-0,01
	(7) Over 50	0,532	0,500							1,00	-0,25	-0,03	0,03	0,08	-0,22	0,23	0,30	0,24	0,15	-0,17	0,08	0,13	-0,14
Gender	(8) Fem (=1)	0,506	0,501								1,00	-0,03	-0,07	-0,07	-0,01	-0,06	-0,10	-0,09	0,03	0,10	-0,12	-0,13	0,04
Maximum education attained	(9) Posgrad	0,231	0,422									1,00	-0,14	-0,13	0,04	0,04	-0,04	0,10	0,03	-0,06	0,03	0,04	0,08
	(10) Master	0,064	0,246										1,00	-0,06	0,01	0,01	0,02	-0,01	-0,03	-0,02	0,11	-0,10	0,15
	(11) PhD	0,050	0,218											1,00	0,04	-0,02	0,05	0,06	-0,11	0,05	-0,10	0,11	0,13
Professional category	(12) Assistant (incl. eventual)	0,173	0,378												1,00	-0,48	-0,19	0,04	-0,13	-0,03	-0,01	0,02	0,09
	(13) Graduate Assistant	0,520	0,500													1,00	-0,44	0,26	0,13	-0,26	-0,01	0,13	-0,18
	(14) Service Chief	0,152	0,360														1,00	0,00	0,11	0,02	0,01	0,07	0,10
Labour contract	(15) Effective (=1)	0,520	0,500															1,00	0,07	-0,12	-0,03	0,16	-0,12
Workplace	(16) Health Centre	0,687	0,464																1,00	-0,37	-0,03	0,14	-0,12
	(17) Hospital	0,067	0,251																	1,00	0,04	-0,16	0,06
Training	(18) Ln days ICT Training	4,183	1,041																		1,00	0,04	0,10
Performance	(19) Medical	0,491	0,501																			1,00	-0,09
	(20) Scientific	0,573	0,495																				1,00

Note: significance levels **1%**; **5%**; **10%**.

Table 8: Determinants of the use of the Internet and the Internet perceptions in the case of the Portuguese GPs (Logit model)

		Use of the Internet			'Internet is essential for daily medical practice' (dummy=1 for Yes)
		Hours spent in the Internet for professional purposes (dummy=1 if above the average)	Use of the Internet for daily medical practice (dummy=1 if above the average)	Degree of global Internet use (dummy=1 if above the average)	
Age	[30; 40[	0,053	-0,063	0,817	-0,357
	[40; 50[	0,843	-0,326	-0,440	-1,326
	Over 50	0,841	-0,577	-0,150	-1,119
Gender (Fem=1)		0,210	-0,065	-0,047	0,157
Formal Education (Highest level attained)	Pos graduation	0,127	-0,174	-0,142	0,182
	Master	0,674	-0,134	1,634***	1,004*
	PhD	1,546***	-0,177	0,551	1,273**
Professional category (IC MGF default)	Assistant	-1,121*	-0,181	-1,677**	-1,235*
	Graduate Assistant	-0,540	0,181	-1,729**	-0,529
	Service Chief	-0,342	0,787	-1,554*	-1,178
Labour contract (Effective=1)		-0,118	0,253	-0,178	-0,020
Workplace (local where spends over 50% of total working time)	Health Centre	-0,142	-0,280	-0,271	-0,140
	Hospitals	-2,143	0,214	-0,682	-0,026
Workplace Region (default=Algarve+Alentejo+Islands)	North	0,140	-0,157	-0,243	0,180
	Centre	-0,229	-0,714*	-0,452	-0,205
	Lisbon	-0,030	0,007	0,429	0,623
ICT training (ln number of days)		0,497***	0,500***	0,212*	0,247*
Performance (ln Index)	Medical Daily Practice	-0,059	-0,053	-0,039	-0,013
	Scientific	1,017**	1,742***	1,777***	1,176***
Constant		-1,591**	-0,379	1,591**	1,517*
N					
Yes (1)		101	145	168	196
No (0)		241	197	174	146
Hosmer & Lameshow Test (p-value)		2,795 (0,947)	10,664 (0,221)	4,209 (0,838)	4,557 (0,804)
% Correcta previsão		73,4	66,4	71,9	63,5

Note: statistically significant at *** 1%; ** 5%; * 10%

According to standard measures of goodness of fit the models present a reasonable quality of adjustment. In concrete, and referring to the Hosmer and Lemeshow's (1989) test, which null hypothesis refers that the predicted values by the model are not significantly different from the observed values, given that the p-value is not significant for standard values, this hypothesis is not rejected, leading us to the conclusion that the

models foresee the reality reasonably well. Moreover, the estimated models correctly predict around 70% of the observed values of the dependent variable.

In a multivariable setting, the estimation results (Table 8) demonstrate that factors such as GPs age, type of labour contract, type of workplace, and region where the workplace is located do not influence GPs Internet use and perception. In contrast, the amount of days that GPs had previously spent on ICT related training influence significantly their predisposition to use and their opinion concerning the usefulness of the Internet for their medical daily practice. The GP profile is also critical for explaining the use and opinion of GPs concerning the Internet. The statistical significance of estimate of the coefficient associated with the Scientific Performance variables for all the four models reveal that those GPs that perform better in this dimension (that is, present a higher number of papers at conferences and publish, both in national and international scientific journals, above the average), tend, on average, to use the Internet above the average and consider the Internet as an essential tool for their daily medical practice. Education emerges here as an important variable. In fact, Table 8 shows, that GPs that have or are enrolled in a PhD course present an odds (ration to spend/no to spend above average hours in the internet for professional purposes) almost 5 times higher ($e^{1.546}$) than their licensee degree counterpart. Similarly, a GP that have or is enrolled in a master course present an odds of (global) Internet use five times higher than his/her licensee counterpart. Both master and PhD graduate or enrolled GPs tend to consider to a larger extent than licensees, the Internet as an essential instrument for their daily medical practice. Finally, professional category is also likely to explain GPs use and perception of the Internet. The third model in Table 8 clearly shows that Assistants, Graduate Assistants and Service Chief tend to use the internet less than their Complementary Internal fellows.

Summarising, an unambiguous and strong result that emerges from our estimation is that Internet use and perception of its usefulness is intimately related to previous ICT related training and a more scientific led profile. In this context, we might conjecture that GPs that fail to be involved in training activities related directly to ICTs and/or being enrolled in more formal advanced education (master and PhD) are likely to become e-excluded. Thus, actions by the Health authorities aiming at promoting training actions and awareness for lifelong learning among GPs might constitute important measures for avoiding GPs e-exclusion and to enhance the potential of the Internet in the Health Sector.

Conclusions

The present study aimed at providing a detailed account on the use of (N)ICTs, in particular the Internet, by Portuguese Family Physicians, and its relation with these physicians performance at the level of their daily practice and scientific achievement.

For pursuing such task, we firstly provided a general review of the literature focusing the relationship between human capital and performance linked to information and communicational technologies. This review was approached in two different but interrelated perspectives: economic and technological. The exercise of reviewing existing literature permitted to uncover an important issue - the potential impact of NICTs on human capital accumulation and obsolescence.

Although several international studies exist focusing the role of the Internet on physicians daily practice, there are, to the best of our knowledge, no study relating ICT in general, and the Internet in particular, with GPs human capital (education and training) and profile (scientific versus daily practice).

Given the lack of primary data on these issues we conduct a national survey to Portuguese GPs who were member of APMCG and GPs registered in the Northern Portugal Medical Order. Through this survey 342 valid answers were received. Based on GPs answers we use the non parametric Kruskal Wallis test and logit models to assess our main research questions.

Kruskal Wallis test demonstrate that the group of GPs that argues that “Internet is essential for their daily medical practice” encompasses younger physicians, who tend to work, to a large extent, at hospitals, use more intensively the Internet, admit to experience difficulties using ICT related technologies in a higher degree, had longer periods of ICT related training, present lower medical daily practice performance, and higher scientific performance. An interesting result emerged concerning GPs profiles. Those GPs that present an above the average medical performance are older, present an above the average Internet use, and lower scientific performance. It seems apparent that daily medical practice and scientific activities are, in the case of Portuguese GPs not complementary tasks. Indeed, GPs with scientific performance above average present lower daily medical practice are younger, attained higher education levels, present a higher use of ICTs related to activities (excluding developing a blog, and listen radio/seeing TV in the Internet) and consider that the Internet is essential.

Based on logit estimates, we obtained an unambiguous and strong result - Internet use and perception of its usefulness is intimately related to previous ICT related training and a more scientific led profile.

In this context, we argue that GPs who are not enrolled in training activities related directly to ICTs and/or are not enrolled in more formal advanced education (master (MSc ??) and PhD) tend to fall into a vicious cycle of low use- low perception of the usefulness of the Internet-low ICT related training-low use, becoming thus *e-excluded*.

We advice in these circumstances, that some actions should be undertaken by the Portuguese Health authorities aiming at promoting training actions and awareness for lifelong learning among GPs. Such measures are likely to be important barriers for avoiding GPs *e-exclusion*, and to enhance the potential of the Internet in the Health Sector.

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Appendix

Questionnaire

Inquérito aos Médicos de Medicina Geral e Familiar em Portugal Janeiro 2007

Este inquérito é confidencial e destina-se exclusivamente a fins de investigação científica no âmbito de um protocolo entre a Associação Portuguesa de Médicos de Clínica Geral (APMCG) e a Faculdade de Economia (FEP) da Universidade do Porto.

Por favor tente responder a todas as questões colocando uma X na opção seleccionada.

I. DADOS GERAIS

Q1. Idade (anos) [25,30[☐ [30,40[☐ [40,50[☐ [50,60[☐ [60,70[☐

Q2. Sexo: Masculino ☐ Feminino ☐

Q3. Mais elevado grau de habilitações obtido e há quantos anos:

	A frequentar	Há quantos anos obteve o grau			
		[0;5]	[6;10]	[11;20]	+ 20 anos
Licenciatura	☐	☐	☐	☐	☐
Pós-graduação não conferente de grau	☐	☐	☐	☐	☐
Mestrado	☐	☐	☐	☐	☐
Doutoramento	☐	☐	☐	☐	☐

Q4. Distribuição do tempo de trabalho (%) por local:

	0	[0;25]	[25;50]	[50;75]	[75;100]
Hospitais	☐	☐	☐	☐	☐
Centros de Saúde	☐	☐	☐	☐	☐
Unidades Familiares	☐	☐	☐	☐	☐
Clínicas	☐	☐	☐	☐	☐
Consultório próprio	☐	☐	☐	☐	☐
Outro (especifique p.f.) _____	☐	☐	☐	☐	☐

Q5. No caso de trabalhar num Hospital, Centro de Saúde ou Unidade Familiar, por favor indique a sua Categoria Profissional:

Interno Complementar MGF	☐
Assistente Eventual	☐
Assistente	☐
Assistente Graduado	☐
Chefe de Serviço	☐
Outra (especifique p.f.) _____	☐

Q6. No caso de trabalhar por conta de outrem, indique por favor o tipo de vínculo:

	Contrato administrativo de provimento	Efectivo	Outro (exemplo, 'recibo verde')
Hospitais	☐	☐	☐
Centros de Saúde	☐	☐	☐
Unidades Familiares	☐	☐	☐
Clínicas	☐	☐	☐
Outro (especifique p.f.) _____	☐	☐	☐

Q7. Concelho do local de trabalho: (ver lista de códigos)

Em caso de dúvida no preenchimento, por favor, contactar Teresa Dieguez (telm:917884946) ou Aurora Teixeira (Telm:961456128).

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II. GRAU DE UTILIZAÇÃO DAS TECNOLOGIAS DE INFORMAÇÃO E COMUNICAÇÃO (TICs)

Q8. Posse de computador, ligação à *Internet* e *website*:

	Computador	Ligação à <i>Internet</i>	Website próprio
Em casa	☐	☐	☐
No Local de Trabalho (onde afecta maior tempo no exercício da sua actividade profissional)	☐	☐	☐

Q9. Grau de utilização da *Internet* por grupo de razões (0 - não utiliza; 1 - utiliza pouco;; 5 - utiliza muito):

		0	1	2	3	4	5
Comunicação	Enviar/receber <i>e-mail</i>	☐	☐	☐	☐	☐	☐
	Telefonar via <i>Internet</i> /videoconferência	☐	☐	☐	☐	☐	☐
	Desenvolver um <i>blog</i>	☐	☐	☐	☐	☐	☐
	Outra (acesso a <i>chats</i> , etc.)	☐	☐	☐	☐	☐	☐
Pesquisa de informação e utilização de serviços <i>online</i>	Pesquisar informação sobre bens e serviços	☐	☐	☐	☐	☐	☐
	Utilizar serviços relativos a viagens e alojamentos	☐	☐	☐	☐	☐	☐
	Ouvir rádio/ver televisão através da <i>Internet</i>	☐	☐	☐	☐	☐	☐
	Jogar ou fazer <i>download</i> de jogos, imagens ou música	☐	☐	☐	☐	☐	☐
	Ler/fazer <i>download</i> de jornais/revistas <i>online</i>	☐	☐	☐	☐	☐	☐
	<i>Download</i> de <i>software</i> (excepto jogos, imagens ou música)	☐	☐	☐	☐	☐	☐
	Procurar emprego ou enviar candidaturas/ <i>curriculum</i>	☐	☐	☐	☐	☐	☐
Educação /formação	Pesquisar informação sobre assuntos relativos à sua actividade profissional/investigação	☐	☐	☐	☐	☐	☐
	Desenvolver actividades de educação formal (escola, universidade, etc.)	☐	☐	☐	☐	☐	☐
	Realizar cursos de educação pós-formal (fora do sistema oficial de ensino)	☐	☐	☐	☐	☐	☐
	Realizar cursos relacionados especificamente com oportunidades de emprego	☐	☐	☐	☐	☐	☐

Q10. Nos seus afazeres quotidianos, p.f. indique se já realizou, via *Internet* (*online*), as seguintes tarefas:

	Sim	Não
		dificuldades de utilização falta de interesse
IRS (ex: declaração, consulta da situação)	☐	☐
Segurança Social (ex: abono de família; subsídio de desemprego, de maternidade)	☐	☐
Documentos pessoais (ex: pedido de cartões de eleitor, contribuinte, 2ª via carta de condução)	☐	☐
Bibliotecas Públicas (ex: pesquisa, consulta de catálogos)	☐	☐
Pedido de certidões (ex: nascimento, casamento)	☐	☐
Alteração de morada (através do Portal do Cidadão)	☐	☐
Serviços ligados à Banca (ex: Caixa Directa <i>online</i>)	☐	☐

Em caso de dúvida no preenchimento, por favor, contactar Teresa Dieguez (telm:917884946) ou Aurora Teixeira (Telm:961456128).

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Q11. Actividades desenvolvidas no Local de Trabalho utilizando a Internet (0 - não utiliza; 1 - utiliza pouco;... ; 5 - utiliza muito):

	0	1	2	3	4	5
Actividades de telemedicina	☐	☐	☐	☐	☐	☐
Troca de ficheiros com outras unidades hospitalares	☐	☐	☐	☐	☐	☐
Comunicação externa com cidadãos	☐	☐	☐	☐	☐	☐
Comunicação externa com outras unidades de saúde	☐	☐	☐	☐	☐	☐
Comunicação interna entre serviços	☐	☐	☐	☐	☐	☐
Formação de recursos humanos	☐	☐	☐	☐	☐	☐
Consulta de catálogos de aprovisionamento	☐	☐	☐	☐	☐	☐
Acesso a bases de dados	☐	☐	☐	☐	☐	☐
Procura e recolha de informação/documentação	☐	☐	☐	☐	☐	☐

Q12. Actividades de Telemedicina desenvolvidas no Local de Trabalho (0 - não utiliza; ; 5 - utiliza muito):

	0	1	2	3	4	5
Prescrição electrónica	☐	☐	☐	☐	☐	☐
Teleconsulta	☐	☐	☐	☐	☐	☐
Telediagnóstico	☐	☐	☐	☐	☐	☐
Telemonitorização	☐	☐	☐	☐	☐	☐
Outro (especifique p.f.) _____	☐	☐	☐	☐	☐	☐

Q13. Indique o grau de dificuldade na utilização das seguintes funcionalidades (0 - não utiliza; 1 - pouca dificuldade;... ; 5 - muita dificuldade):

	0	1	2	3	4	5
Consultas por vídeo-conferência	☐	☐	☐	☐	☐	☐
Rastreio médico online	☐	☐	☐	☐	☐	☐
Informação disponibilizada on-line sobre o corpo clínico	☐	☐	☐	☐	☐	☐
Diagnóstico dos Pacientes online	☐	☐	☐	☐	☐	☐
Marcação de consultas online	☐	☐	☐	☐	☐	☐
Recepção de mensagens por correio electrónico, pedidos de informação, sugestões e reclamações	☐	☐	☐	☐	☐	☐
Elaboração de páginas web para diagnóstico clínico	☐	☐	☐	☐	☐	☐
Elaboração e manutenção de forums/chats na Internet	☐	☐	☐	☐	☐	☐

Q14. No último ano, quantas horas por semana (em média), utilizou a Internet:

Para fins profissionais hs

Para outros fins hs

Q15. Diga o grau de concordância com a seguinte afirmação (0 - discordo completamente ...; 5 - concordo plenamente)

	0	1	2	3	4	5
"A Internet é essencial para a minha prática médica quotidiana"	☐	☐	☐	☐	☐	☐



III. FORMAÇÃO PARTICIPAÇÃO EM CONGRESSOS, CURSOS DE PÓS-GRADUAÇÃO, FORMAÇÃO DA SUB-REGIÃO

Q16. Grau de utilização da *Internet* na **recolha de informação** para as diversas actividades relativas ao seu dia-a-dia profissional
(0 - não utiliza; 1 - utiliza pouco;... ; 5 - utiliza muito):

	0	1	2	3	4	5
Diagnóstico clínico	☐	☐	☐	☐	☐	☐
Actualização pessoal no domínio profissional	☐	☐	☐	☐	☐	☐
Informação para o Paciente	☐	☐	☐	☐	☐	☐
Informação Farmacológica	☐	☐	☐	☐	☐	☐
Informação para realizar trabalhos académicos ou preparar-se para exames	☐	☐	☐	☐	☐	☐
Curiosidade	☐	☐	☐	☐	☐	☐
Resolução de dúvidas	☐	☐	☐	☐	☐	☐
Outro (especifique p.f.) _____	☐	☐	☐	☐	☐	☐

Q17. Principais fontes de **informação** para as diversas actividades relativas ao seu dia-a-dia profissional (0 - não utiliza; 1 - utiliza pouco;... ; 5 - utiliza muito):

		0	1	2	3	4	5	Forma de consulta (privilegiada)	
								Internet	Impresso
Revistas/ Journals	Jornal Médico de Família	☐	☐	☐	☐	☐	☐	☐	☐
	Revista Portuguesa de Clínica Geral	☐	☐	☐	☐	☐	☐	☐	☐
	Tempo Medicina	☐	☐	☐	☐	☐	☐	☐	☐
	Portuguese Medical Journal	☐	☐	☐	☐	☐	☐	☐	☐
	American Board of Family Practice	☐	☐	☐	☐	☐	☐	☐	☐
	American Family Physician	☐	☐	☐	☐	☐	☐	☐	☐
	The Journal of the American Medical Association	☐	☐	☐	☐	☐	☐	☐	☐
	Annals of Family Medicine	☐	☐	☐	☐	☐	☐	☐	☐
	Archivos en Medicina Familiar	☐	☐	☐	☐	☐	☐	☐	☐
	Family Medical Practice Online	☐	☐	☐	☐	☐	☐	☐	☐
	Family Practice Management	☐	☐	☐	☐	☐	☐	☐	☐
	Familydoctor	☐	☐	☐	☐	☐	☐	☐	☐
	Patient Care	☐	☐	☐	☐	☐	☐	☐	☐
Outras (especifique p.f.):	_____	☐	☐	☐	☐	☐	☐	☐	☐
	_____	☐	☐	☐	☐	☐	☐	☐	☐
	_____	☐	☐	☐	☐	☐	☐	☐	☐

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Páginas da Internet	Livros de carácter técnico-científico	☐	☐	☐	☐	☐	☐	☐	☐
	Portal da Saúde - Portugal	☐	☐	☐	☐	☐	☐	☐	☐
	Associação Portuguesa dos Médicos de Clínica Geral	☐	☐	☐	☐	☐	☐	☐	☐
	<i>The New England Journal of Medicine</i>	☐	☐	☐	☐	☐	☐	☐	☐
	MEDLINE	☐	☐	☐	☐	☐	☐	☐	☐
	<i>American Medical Association</i>	☐	☐	☐	☐	☐	☐	☐	☐
	<i>Medicine Online</i>	☐	☐	☐	☐	☐	☐	☐	☐
	<i>International Health News</i>	☐	☐	☐	☐	☐	☐	☐	☐
Outras (especifique p.f.):	<i>Medical Journals</i>	☐	☐	☐	☐	☐	☐	☐	☐
	_____	☐	☐	☐	☐	☐	☐	☐	☐
	_____	☐	☐	☐	☐	☐	☐	☐	☐
	_____	☐	☐	☐	☐	☐	☐	☐	☐

Q18. Qual a importância que atribui às seguintes formas de actualizar/complementar de conhecimentos (0 - não utiliza; 1 - pouco importante;...; 5 - muito importante):

	0	1	2	3	4	5
Leitura de bibliografia especializada em Bibliotecas	☐	☐	☐	☐	☐	☐
Leitura/pesquisa através Internet	☐	☐	☐	☐	☐	☐
Formação em sala de aula (formal) de carácter geral	☐	☐	☐	☐	☐	☐
Formação (formal ou informal) de carácter específico (ex: dirigida à resolução de um problema) encontros/ cursos/workshops	☐	☐	☐	☐	☐	☐
Interação em pequenos grupos de colegas/sessões teóricas e/ou práticas (reuniões de serviço, reuniões de internos)	☐	☐	☐	☐	☐	☐
Pequenas reuniões internas com elementos externos ao Serviço	☐	☐	☐	☐	☐	☐
Delegados de 'propaganda médica'	☐	☐	☐	☐	☐	☐
Outro (especifique p.f.) _____	☐	☐	☐	☐	☐	☐

Q19. Diga, por favor, qual o grau de concordância com as seguintes afirmações (0 - não concordo de todo; ...; 5 - concordo em absoluto):

	0	1	2	3	4	5
"As novas Tecnologias de Informação e Comunicação (TICs) têm contribuído para uma crescente desactualização na base de conhecimentos dos Médicos de Medicina Geral e Familiar portugueses"	☐	☐	☐	☐	☐	☐
"Para o caso dos Médicos de Medicina Geral e Familiar portugueses existe um défice de acções de formação específica no domínio das TICs direccionada para aplicações concretas na medicina"	☐	☐	☐	☐	☐	☐
"Para o caso dos Médicos de Medicina Geral e Familiar portugueses existe um défice de acções de formação de carácter geral no domínio das TICs"	☐	☐	☐	☐	☐	☐
"Sente necessidade de frequentar acções de formação específica no âmbito das TICs"	☐	☐	☐	☐	☐	☐
"Sente necessidade de frequentar acções de formação de carácter geral no âmbito das TICs"	☐	☐	☐	☐	☐	☐

NOTA: TICs - Tecnologias de Informação e Comunicação

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Q20. No último ano, quantos dias de formação efectuou:

	0	[1;7]	[8;15]	[16;30]	[31;45]	[46;60]	>60
Directamente relacionada com as Tecnologias de Informação e Comunicação	☐	☐	☐	☐	☐	☐	☐
Outra formação relacionada com a sua actividade profissional	☐	☐	☐	☐	☐	☐	☐

IV. ACTIVIDADES RELACIONADAS COM A PRÁTICA MÉDICA - CONSULTAS, PRESCRIÇÕES E GESTÃO

Q21. No último ano, em média, por semana, qual o número:

* de pacientes vistos:

* de prescrições médicas passadas:

* de horas dedicadas a assuntos de gestão e direcção da unidade onde exerce a sua actividade:

V. INVESTIGAÇÃO CIENTÍFICA - COMUNICAÇÕES E PUBLICAÇÕES

Q22. Nos últimos 3 anos, qual o número (total) de palestras/comunicações/publicações apresentou/publicou:

	0	1	2	3	4	5	>5
Palestras (eventos que não Congressos):	☐	☐	☐	☐	☐	☐	☐
Comunicações em Congressos Nacionais:	☐	☐	☐	☐	☐	☐	☐
Comunicações em Congressos Internacionais:	☐	☐	☐	☐	☐	☐	☐
Publicações em Revistas Nacionais:	☐	☐	☐	☐	☐	☐	☐
Publicações em Revistas Internacionais:	☐	☐	☐	☐	☐	☐	☐

Muito obrigado pelo seu valioso contributo!

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Table A1: Summary of studies on Internet Use within the Health System

Sub-group	Purpose	Methodology	Country	Authors (date)
Survey of Health and Medical	To identify Usage of Internet for Health/Medical Purposes, Quality; Impact on the Patient -Physician Relationship; Accessibility and other Ongoing Challenges and Profile of Respondents	• 2.012 respondents • on-line questionnaire	Worldwide: mainly from USA (43%).	© Health On the Net Foundation
	To measure the extent of Internet use for health care, on users' knowledge about health care matters and their use of the health care system	• 4764 individuals aged 21 years or older • Research panel developed and maintained by Knowledge Networks.	USA	Baker et al. (2003)
	To look at developments in ICTs and their potential impacts on, and implications for, health and healthcare over the next 10-15 years.	• Working Group including experts from different areas) • Open Call for evidence • 3 workshops with scientific and technological experts, healthcare professionals and patient groups' representatives to ensure the working group was aware of the views of the various stakeholders concerned with healthcare information and communication technologies	UK	Royal Society (2006)
GPs – Internet	To understand how the usage of the Internet is evolving amongst different physicians segments.	• 1750 GPs • Telephone (1000) and online (750) • Conducted among nationally representative samples GPs	USA, Canada, the UK, Germany, France, Italy, Spain, and Brazil.	P\SL Research (2007)
	To determinate whether practice differences of General Practitioners (GPs) vs Obstetricians (OBs) would lead to a difference in their Internet use	• 536 physicians: 172 OBs 172 and 438 GPs • Mail questionnaire	USA	Eitel et al. (1998)
	Provide insights into the potential pace of physician adoption of IT that can substantially improve patient safety and quality of care.	• 267 Physicians for Primary Care (5,7%) • Telephone interviews	USA	Miller et al. (2002)
	To examine a preliminary step to explore the major implications of physician' Internet use on the traditional areas.	• 445 GPs (24,7% of the total). • mail • designed with the help of Internet specialists and medical practitioners from St. Louis Metropolitan Medical Society to ensure the relevance of questions	USA	Kwon. and Xie.(2003)
Other Physicians – Internet	To study specifically on the impact of Internet health information on patient's perception of doctors and the medical profession.	• 406 interviews (57% of the total) • telephone survey of a random sample of households with telephone	USA	Lowrey. and Anderson (2006)
	To evaluate the level of use of online technology among doctors in the developed countries of Europe.	• 1,000 Physicians • Telephone-based research	Germany, France, Spain, Italy and the United Kingdom	Take the pulse @ Europe
	To study how Canadian physicians use the Internet as a tool or source of information to support treatment or in direct patient care.	• 2250 Physicians (28,4%) • mail	Canada	Martin (2004)

(...)

Sub-group	Purpose	Methodology	Country	Authors (date)
GPs – other issues	To explore the information needs and information seeking behaviour of family doctors	• 58 GPs (70%) • Case Study with a quantitative study (19 individual interviews) and two qualitative techniques, in-depth interviews and group discussions (39)	USA	Bryant (2004)
	To examine the information seeking behaviours of members in a primary care practice-based research network (PBRN) to inform future efforts supporting primary care practitioners in their daily care of patients.	• 59 Primary Care Practitioner, member of the Kentucky Ambulatory Network (51%) • cross-sectional survey	USA	Andrews et al. (2006)
Other Physicians – other issues	To evaluate the use of Electronic Medical Record (EMR) near physician practices	• 9 large medical groups of more than seventy physicians each, 80 solo/small-group practices of ten or fewer physicians, and three medium-size groups. • Interviews	USA	Miller and Sim (2004)
	To develop an understanding of HIV treating physicians	• 1154 surveys (11%) • Mail with “paid return stamp”	USA	Drezner (1998)
	To understand the literature searching experiences and skills of clinical research coordinators at a large academic medical centre.	• 46 individuals • email • variety of job titles and educational levels	USA	Wessel et al. (2006)