The METIS project for generalist ultrasonography

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KEYWORDS

Primary-care group practice;
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Educational and training courses.

Abstract Reorganization of the community healthcare system and the growing presence of group practices in the field of general medicine have increased the demands placed on primary-care medicine, in terms of the skills required and the level of responsibility. Satisfying the need for rapid, effective primary-care solutions to the health problems of citizens is easier thanks to technological and medical advances that provide high level equipment at costs within the reach of general practitioners (GPs). In the near future, trained GPs equipped with appropriate diagnostic scanners will be able to handle up to 40% of the requests of ultrasound examinations of each primary-care group (each PCG includes approximately 15,000–20,000 citizens). The Italian Federation of General Practitioners (*Federazione Italiana dei Medici di Medicina Generale – FIMMG*) and its Scientific Society, METIS, have organized national courses for those GPs who wish to become generalist ultrasonographers, in a joint effort with the two most important Italian scientific societies of imaging, the Italian Society of Ultrasonology in Medicine and Biology and the Italian Society of Medical Radiology.

Sommario Vengono descritti i cambiamenti organizzativi che ha affrontato negli ultimi anni la Medicina Generale e il ruolo e le potenzialità che potrebbe avere l'ecografia negli studi dei Medici di Medicina Generale (MMG) migliorando l'iter diagnostico-terapeutico di molte patologie.

Vengono analizzate la quantità, la distribuzione dell'offerta di ecografie sul territorio e l'appropriatezza della richiesta attuale.

Viene presentato il progetto formativo Ecografia Generalista METIS – FIMMG – SIUMB il cui obiettivo è la formazione di Ecografisti Generalisti di supporto alla attività delle strutture territoriali di cure primarie (UMG, NCP case della Salute ecc.) e i risultati attesi dalla introduzione dell'ecografia.

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Introduction

In recent years, community healthcare in Italy has been subjected to radical changes that have led to demanding,

but stimulating, reassignment of healthcare responsibilities to physicians involved in primary-care.

As a result of the national healthcare service (NHS) reforms, many diseases that were previously managed exclusively in hospital settings (or at least until the clinical condition of the patient had almost completely stabilized) are now being cared exclusively by community-based practitioners; for others, the patient is returned to the community after increasingly brief periods of hospitalization (the so-called “difficult discharges”).

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As a result of technological advances in the field of electronics, the decreasing costs of electronic equipment, and the increasing presence of group practices, the offices of general practitioners and family physicians (GPs) are being equipped with electrocardiography (EKG) machines, spirometers, oxygen meters/blood-gas analyzers, blood chemistry analyzers, Holter pressure monitors, scanners for ultrasound and color Doppler ultrasound examinations, etc.

In some cases, these devices can accelerate the diagnostic/therapeutic process and resolve the patient's problem within family medicine clinic; in other cases, they can provide guidance for subsequent prescriptions and specialist referrals (thus improving diagnostic and therapeutic appropriateness).

Last but not least, they offer considerable advantages from the viewpoint of the healthcare consumer, who finds that many of his problems can be rapidly and completely resolved in his personal physician's office, while for others the diagnostic work-up is shortened considerably.

Naturally, the use of these instruments requires adequate training, and this is particularly true of ultrasonography. The training process involves the acquisition of conceptual and practical skills of a high technical level.

Ultrasonography

In recent years, ultrasonography (US) has expanded transversally through all branches of clinical medicine. It has changed our approach to many diseases and the science of interpreting the signs and symptoms of disease has been rendered in part obsolete, or more precisely, it has been replaced by the science of interpreting the sonographic signs of disease.

For years, the cost of equipment prevented widespread use of ultrasonography among practitioners of general medicine (GPs). With the introduction of relatively low-cost, basic, mid-range ultrasonography scanners, practitioners in the field of family medicine are beginning to express interest in this instrument, which has already transformed the image of other fields of medicine. The presence of an ultrasound scanner can change the way a general practitioner looks at many diseases, acute and chronic (in follow-up), and it can have positive effects on the outcomes of his case management. It was proven long ago that, for management of patients with abdominal pain (or abdominal pathology in general), direct access to

ultrasound equipment by GPs can reduce inappropriate use of hospitals and improve the outcome of treatment [1].

It was recently shown that diagnostically valid abdominal US examinations performed by GPs have favorable effects on patient management [2]. With adequate training, the same can be said for examinations involving the neck, blood vessels, muscles and tendons, and so on.

The numerical dimensions of the demand

In the year 2000, the number of sonographic studies performed in NHS centers (or centers reimbursed by the NHS) was 17.4 per 100 inhabitants (National Institute for Statistics—Health for all 2007), approximately 9,200,000 studies a year. This does not include those sonographic examinations performed in inpatient settings or those done in private healthcare facilities that operate outside the boundaries of the NHS, which are paid for in full by the patients themselves.

In the same year, the figures for the Emilia Romagna region were the second highest in Italy: 23.5 examinations for every 100 inhabitants or 940,000 examinations a year (Fig. 1).

Findings collected in 2003 by several groups of GPs consistently indicate a mean demand of approximately 350 sonographic studies/year/GP with the maximum registered patient load permitted by law (i.e., 1500 registered patients), which corresponds to a yearly demand at the national level of around 12 million examinations.

In 2003, there were approximately 8.5 million hospital admissions in Italy, and the sonographic examinations performed during these hospitalizations are not represented in the incidence of examinations per 100 inhabitants. Ultrasonography has become such a widely used diagnostic method that at least one examination was performed during each hospitalization. In light of these data, 18 million seems to be a reliable estimate of the number of sonographic examinations performed in 2003.

In the Emilia Romagna region, where the authors work, the number of "community-based" sonographic examinations increased from 940,000 in 2000 to 1,400,000 in 2005, and the rate of examinations per 100 inhabitants rose from 23.5 to 35, an increase of 49% with respect to 2000, which corresponds to 510 examinations for each GP with 1500 patients.

If similar increases were to be confirmed in the other regions of Italy, the total number of sonographic

Fig. 1 Number of US studies performed per 100 inhabitants in the year 2000. Data are shown for Italy as a whole and for various regions. Source of data: ISTAT—HFA 2007.

examinations performed each year (including those performed in inpatient settings and in private healthcare facilities) would probably be well above 24 million.

The logistics of equipment allocation

In 2002, there were 19 ultrasound scanners for every 100,000 inhabitants within the national territory: 16/19 were located in state-owned hospitals or private inpatient clinics (operating approved for SSI reimbursement and used solely for inpatient services), and 3/19 were located in local outpatient structures [3]. The ratio of inpatient to outpatient scanners was thus around 5:1, while over 60% of the orders for ultrasound studies came from GPs and involved non-hospitalized patients.

As a result of this markedly inappropriate distribution, patient needs are often unmet, in part due to logistic problems.

It should also be noted that in the year 2000, 30% of these scanners were over 7 years old (very old for electronic equipment) and only 42% were less than 3 years old.

Offer and demand for ultrasound studies in general medicine

Around 2/3 of all ultrasound studies are ordered by community practitioners, in most cases, by GPs, but over 80% of the scanners are available only in hospital structures. With reference to diagnostic ultrasound studies, is the offer appropriate to the demand? First of all, there are several general considerations that must be stressed regarding the changes occurring in the national healthcare model:

- Inpatient care is characterized by an increasing high level of technology and an appreciable decrease in the absolute number of hospital beds.
- The number of patients being managed in the primary-care system and extra-hospital circuit has increased.
- The level of diagnosis being made in local outpatient settings has risen.
- More and more complex diseases requiring higher levels of professional commitment are being managed in local outpatient settings.

The objectives of this reorganization are as follows:

- To rationalize the allocation of resources.
- To improve the appropriateness of the diagnostic and therapeutic processes.
- To improve the healthcare services offered to the citizen resolving health problems within reasonable intervals of time without resorting to hospitalization; to increase the accessibility of diagnostic and therapeutic services capable of resolving health problems with as few as possible intermediate steps/contacts (more efficient and effective interventions).

At this point, we can consider the first part of our question: with reference to diagnostic ultrasound studies, is the offer appropriate to the demand? Unfortunately, the

answer is no. The offer is quantitatively and logistically inadequate, with the majority of the equipment located in inpatient centers and extended waiting lists for all types of diagnostic and therapeutic procedures.

This problem might be attributed to an excessive demand. This possibility is often raised (and sometimes affirmed) by administrators and persons with organizational responsibilities in the Public Health Agencies. There are, however, data that demonstrate the requests for II-level (specialist) services within the NHS generated by GPs are not inappropriate [4].

In a recent study conducted in Belgium [5] on the appropriateness of requests for outpatient radiological examinations, in the consensus judgment of two radiologists, 74.4% of the referrals by GPs were consistent with current guidelines.

Ultrasonography allows the physician to "look inside the patient," in real-time and without risk to the patient or the physician, to verify or correct diagnostic hypotheses founded on the patient history and physical examination. With a diagnostic instrument as powerful and safe as this, it is difficult to imagine how it might be used inappropriately!

The demand for ultrasound studies is not excessive: the problem is that the method is being underutilized in GPs' offices. Increased use is not possible, however, due to the waiting lists and because it would saturate the system, compromising the significance and the peculiarities of level II and III US outpatient clinics, hospital- or community-based.

Any GP with a large practice (1200 patients) knows that a rate of 1.1 orders for sonography per workday is actually quite low considering the method's potential and the needs that have arisen in recent years due to territorial healthcare reforms.

The only solution is to bring ultrasound equipment to the office of GPs (particularly those that have formed associated groups), where it can be used more widely to integrate the traditional work-up. The potential advantages of this approach, in terms of more appropriate diagnosis and treatment, are clear. It will also lead to optimization of the use of resources, but not only those directly related to the service provided. By reducing the number of workdays lost by patient/citizens to resolve their health problems and those of their family, this approach provides significant savings for the general economy of the society.

Ultrasonography and the family medicine practitioner: certainties and projections

According to the study center of the Italian Federation of General Practitioners (*Centro studi della Federazione Italiana Medici di Medicina Generale – FIMMG*) [6], 7.6% of all GPs had an ultrasound scanner in their offices in 2003. The frequency was higher among GPs from southern and central Italy compared with those of the north. An extremely interesting finding is the fact that scanners were owned by 14.6% of GPs under the age of 44 years and only 1.4% of those over 55 (Table 1).

Other studies indicate that around 18% of all family medicine practitioners plan to equip their offices with an ultrasound scanner (Italian society of general medicine – *Società Italiana di Medicina Generale*, 2004).

Table 1 Staff and equipment features of the offices of general practitioners (GP) working through the national health system (NHS) according to the characteristics of the GP

GP characteristics	Staff		Medical equipment			
	Physicians	Others ^a	EKG	US	Spirometer	Doppler
Practice area						
Northern Italy	47.3%	11.7	35.0	4.6	19.4	9.3
Central Italy	58.2	7.0	42.1	10.3	24.1	24.7
Southern Italy	32.3	21.7	31.7	9.1	29.3	10.7
Total	44.6	14.1	35.6	7.6	24.0	13.5
Physician age (years)						
≤44	61.5	10.7	26.1	14.6	18.7	13.1
45–54	43.9	10.4	39.2	8.5	24.8	14.9
≥55	39.3	27.8	28.1	1.4	24.0	9.1
Total	44.6	14.1	35.6	7.6	24.0	13.5
Professional activities						
GP only	42.3	14.6	31.8	4.9	22.9	9.5
GP + activity in other NHS facility	43.1	8.0	22.4	20.3	10.8	24.1
GP + private practice	50.1	14.4	46.9	10.4	29.7	19.7
Total	44.6	14.1	35.6	7.6	24.0	13.5

Source: FIMMG study center, 2003.

^a Nurse, secretary, and other healthcare professionals.

The mean age of Italian GPs is fairly high, and most US scanners are owned by GPs under 54 years of age. Within 10 years, around 50% of today's GPs will have been retired. Based on projections, it is thus reasonable to expect that in the coming years, there will be from 3500 to 8500 new GPs who will be using these instruments to improve their own diagnostic capabilities and those of the medical groups they are a part of.

General medicine units, primary-care nuclei, health houses, and similar facilities (each serving a mean population of 15,000 inhabitants) have already been set up in some areas. Given the projected increase in the demand for sonographic examination, each of these facilities would require 2–3 generalist sonographers to cover 40% of the requests made by the GPs themselves.

This will allow each generalist sonographer to perform an average of six examinations per workday, a number that is certainly sufficient to ensure the quality of the examinations, in terms of both the case series and the amount of time devoted to each study.

The widespread presence of sonographers throughout the territory will make it easier to meet the objectives of the structural changes in primary-care.

Training

The real problems revolve around the issue of training needed to produce new generalist sonographers and continuing education for those who already use this tool.

The ultrasound scanner is an instrument, not a specialist field, an instrument that physicians working in all fields have learned to use to expand the professional services they offer.

In some ways, it is like the stethoscope: originally an object of controversy and used by a small minority of practitioners, it is today an instrument of the masses.

Other categories of medical practitioners have already been down this road. Their experiences and the problems they have encountered as "trail-blazers" are a resource that must be tapped by GPs to minimize the risk of errors [7].

The training program must be both feasible and attractive; its goal must be to impart "know-how" rather than information; it must be ongoing and adequate for the sector it is related to. To use the updated adult-education terminology coined by Gilbert [8], the program should provide GPs with the "intellectual and practical skills" necessary for them to be able to perform an appropriate and reliable sonographic examination. The final goal is to produce a population of competent GP sonographers.

The generalist sonographer

The first step in designing a training program for generalist sonographers is to define the figure itself. A generalist sonographer is one who:

- can intervene at the primary-care level;
- is involved in all of the fields of study in family medicine;
- can use ultrasound scanner to supplement the physical examination of his/her colleagues (medicine associates) or provide them with diagnostic support;
- has as his objective the differentiation of the normal from the pathological, in terms of sonographically detectable signs, and thereby provides guidance for diagnostic and therapeutic decision-making processes (*appropriateness*).

The FIMMG–METIS school for generalist sonography

To provide guidance, as well as educational and organizational support, for the GP training program, METIS, the

Table 2 Check-list used in the METIS–FIMMG SIUMB school in Colorno (Province of Parma) to assess the diagnostic skills of trainees according to the sonographic guidelines for the practice of sonography published by the SIUMB [9]

Identification of standard scans of the following organs according to SIUMB guidelines		Organ variables to be determined according to SIUMB guidelines		Notes
Organ/system	Done	Organ/system	Done	
Liver		Cranio-caudal diameter of the right lobe Cranio-caudal diameter of the left lobe Dimensions of the caudate lobe		Classification and limits of the method
Gall bladder and bile ducts		Diameters of the gall bladder <ul style="list-style-type: none"> • Longitudinal • Transverse • Anteroposterior Caliber of the main and intrahepatic bile ducts		
Spleen		Bipolar diameter		
Pancreas		Section area Dimensions of the: <ul style="list-style-type: none"> • Head • Body • Tail Major longitudinal axis Major transverse axis		
Kidneys		Measurement of the three bladder diameters w/estimation of volume in cubic centimeters		
Bladder		Volume		
Prostate (suprapubic approach)		Post-voiding residual urine		
Gynecologic examination (suprapubic approach)		Uterus: diameters <ul style="list-style-type: none"> • Cervix–fundus • Anteroposterior • Transverse Ovary: calculation of volume with the formula for an ellipsoid (length × width × thickness × 0.522)		
Breast				
Thyroid		Lobes–diameters: <ul style="list-style-type: none"> • Sagittal • Anteroposterior • Laterolateral Isthmus–diameters: <ul style="list-style-type: none"> • Anteroposterior • Sagittal Each gland: <ul style="list-style-type: none"> • Sagittal axis • Anteroposterior axis • Transverse axis Longitudinal/transverse diameter ratio		
Salivary glands		Testis: <ul style="list-style-type: none"> • Sagittal axis • Transverse axis • Anteroposterior Calculation of volume with the formula for an ellipsoid (length × width × thickness × 0.522)		Limited to the disorders most often seen by GPs Limited to the disorders most often seen by GPs Great vessels of the abdomen, supraaortic trunks Arteries and veins of the legs
Lymph nodes				
Scrotum				
Musculo-skeletal structures				
Vascular structures		Caliber of the abdominal aorta		

Table 3 Requirements for FIMMG certification as a generalist ultrasonographer

- Completion of 3 theoretical courses (~80 h) in 2 years
- Completion of 16 days of practical training at the school (120 h practice and 20 h of tutor-supervised diagnostic scanning organized during the weekends for small groups)
- Execution of 960 ultrasound examinations, self-certified or certified by the school director
- Completion of generalist ultrasonography course organized by the SIUMB during its annual congress

scientific society of the FIMMG, has founded the FIMMG–METIS school for generalist sonography in agreement with the Italian Society of Ultrasonology in Medicine and Biology (*Società Italiana di Ultrasonologia in Medicina e Biologia*, SIUMB) and the Italian Society of Medical Radiology (*Società Italiana di Radiologia Medica*, SIRM).

Each year, the school offers two 3-day courses on theory, one 8-day course on principles and practice, and various monothematic courses on the principles of ultrasonography related to specific areas. At the end of 2007, theoretical courses will also be offered in outlying regional settings.

Practical courses began in the fall of 2006 and were held on weekends to allow trainees to earn their certificate in generalist ultrasonography in accordance with SIUMB guidelines.

From the outset, the school has given priority to the quality of its teaching methods and the effective use of frontal lecture-based instruction vs. practical training in small groups. In particular, during the sessions dedicated to the acquisition of practical skills, trainees are closely supervised by their tutors (expert sonographers with

various backgrounds and types of professional experience). This approach gives the trainee sufficient time to learn how to carry out the scan and measure organs and apparatuses and eliminates work-related absences from class during this essential but delicate phase of the training program (a risk that is widely recognized by persons involved in training and by those who evaluate its quality) [7].

Each tutor is responsible for a group of trainees. He/she verifies that the trainees have learned how to carry out examinations that are as consistent as possible, from the outset, with the guidelines drawn up by the SIUMB [9]. The tutor also administers a structured test at the end of the course to determine whether the trainees have met the predefined course objectives (Table 2).

During these sessions the tutor:trainee ratio is never less than 1:3. The trainee has sufficient opportunities to repeat the sonographic examinations on dummies and on patients in the extended care ward attached to the school. Complex cases involving the clinical aspects of the abdominal [1,2,10–12], musculo-skeletal [13,14], vascular [15,16] and mammary [17] problems seen on a daily basis by GPs are examined and discussed.

Table 3 summarizes the essential phases of training that must be completed to obtain a Diploma in generalist sonography.

The METIS school of ultrasonography for general practitioners contributes to the training policies and provides liaison services for the scientific societies that are its partners in this project (Fig. 2). By means of a specialized company, it provides quality control during all phases and activities of the courses (lectures and practical training sessions).

The expected impact of this project and the plan to include sonographic examinations among the services offered by GPs can be summarized as follows:

Fig. 2 Roles and relations of METIS, SIUMB, and SIRM in the training project for GP sonographers. Quality control of courses.

- Greater consumer satisfaction.
- Improved outpatient and home-based healthcare.
- More rapid and more rational diagnostic work-ups.
- More rapid diagnosis and more appropriate therapy.
- Economic savings related to diagnostic work-ups.
- Shorter waiting lists.
- Sense of educational achievement for physicians.
- I and II level ultrasound outpatient clinics that can effectively perform this level of investigation.

The project and its objective may seem overly ambitious, but both are entirely feasible, as demonstrated on a small scale by the audit published in 2002 in Scotland, which reports positive experiences and assessments on this issue [18]. The FIMMG–METIS sonography project is based on a training program that has been carefully designed to ensure the quality of the diagnostic imaging studies performed by GPs, who by continuing to use the ultrasound scanner in their offices maintain an adequate and appropriate process of ongoing education.

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