Health surveillance and occupational risk prevention

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Abstract

Health surveillance aims at safeguard health and ensure the greatest possible protection against occupational risks and for this reason it *should ensure hazard and risk control in the working environment as well as providing an appropriate detection and assessment of specific risks associated to every enterprise.*
The main changes in the global economy and the reorganization of services and production processes led to many changes in working life conditions and employers responsibilities, bring to the urgent need for the development and adaptation of the equipment and working methods in view of ensuring a proper protection, promotion and management of health, environment and safety issues at the corporate level.
Today industrial accidents still affect significant cost in terms of not only economic but also social matters and for this reason we must emphasize the important role of occupational medicine in injury prevention through the protection and promotion of workers' health, the improvement of working and production systems, the encouragement of a "working" culture to improve the health and safety of workers in the broadest sense, both individually and collectively.
Therefore, in order to prevent workplace accidents, the occupational physician should develop a methodology taking into account a whole range of factors, including the personal ones, which can be correlated to the risk to be injured planning and enacted* effectiveness, efficiency, fairness and ethics *interventions.
Health surveillance should allow the identification of workers and/or groups of workers with the highest frequency and the greatest risk of injury, in order to direct preventive efforts in the right direction with multidisciplinary interventions through development of full cooperation not only with employers, workers and their representatives but also with other professionals may have been involved.
Only through close cooperation and joint efforts of the professionals involved that you will be to reduce the number, severity and, therefore, the weight that workplace accidents have on society today.

KEY WORDS: accident prevention, occupational accidents, occupational medicine, security measures, work.

Introduction

Health surveillance is the continuous, systematic collection of health-related data needed for the protection of workers' health and safety in connection to the workplace, occupational risk factors and work patterns (1); it consequently seeks to safeguard health and ensure the greatest possible protection against occupational risks (2). It could be considered as a response to the multiple and significant changes the labour market has undergone in the last two decades, with important implications for the workers' safety and health conditions (3); indeed, occupational accidents and diseases can today be held responsible for:

- reduced working capability;
- increased number of workers with permanent or temporary invalidity;
- shorter life expectancy;
- higher number of early retirement requests;
- higher number of premature deaths.

We have been witnessing a change in the type of risks to which the working population is exposed: physical and chemical risks are declining as opposed to the increase of those related to new technologies, changing working conditions and processes and to innovative patterns of work (i.e. ageeing workforce, home and call-center workers, increased demand for productivity, greater individual responsibilities, psychological, social, self-control and workload related stress, etc.) (4,5). The main changes in the global economy as well as the constant reorganization of services and production processes, accompanied by different working life conditions and employers responsibilities, have underlined the urgent need for the development and adaptation of the equipment and working methods in view of ensuring a proper protection, promotion and management of health, environment and safety issues at the corporate level (6-9).

Health surveillance

Health surveillance should ensure hazard and risk control in the working environment as well as providing an appropriate detection and assessment of specific risks associated to every enterprise.
In particular, health surveillance programs should meet specific requirements in order to be accepted: need, relevance, scientific validity, reliability, effectiveness and efficiency (2,10).
Health surveillance consists of a series of medical examinations including, when necessary, proper laboratory tests, biological, radiological and other diagnostic tests that the employee undergoes in view of verifying his/her general state of health and fitness for the tasks he/she has been assigned to. Moreover, it also constitutes the tool through which the worker's health can be monitored over time in order to prevent the occurrence of accidents, in the short term, and of occupational diseases, in the long term.
Health surveillance is mainly focused on the protection of the workers' state of health and safety through:

- assessment of compatibility between health conditions and working tasks;
- identification of individual conditions of hypersusceptibility to occupational hazards;
- evaluation of the effectiveness of prevention measures implemented in the company.

The current legislation identifies different types of medical examinations:

- a preventive medical examination, in phase of post-recruitment and before task assignment, designed to establish:
  - the absence of contraindications in the workplace of the employee, in order to assess his fitness to work;
  - the compatibility of the task assigned with the specific health conditions of the individual;
  - the evaluation of the employee's health conditions, which will provide contents for subsequent follow-up visits;
- a periodic medical examination designed to establish:
  - the state of workers' physical health;
  - the presence of any early deterioration of the worker's health conditions as a result of his/her exposure to specific occupational hazards;
  - his/her fitness for a specific task;
  - the effectiveness of preventive and protection measures.
- a medical examination upon request of the employee, carried out only in case the medical officer considers it related to the likelihood of a deterioration in the worker's health conditions as a result of the task performed, in order to asses if the employee can safely carry out a specific task;
- a medical examination on the occasion of changing job duties, in order to assess if the employee is medically fit to perform the task;
- a medical examination on the termination of employment (as required by the current regulations);
- a preventive medical examination in phase of prerecruitment which can be carried out, upon request of the employer, by the occupational physician and by Departments of the National Health Service (NHS) responsible for health prevention;
- a medical examination before resuming work, if the employee has been away for more than sixty consecutive days, in order to determine if the employee is medically fit to perform the task assigned (1,2,9,11,12).

The above listed examinations are also aimed at verifying, except for those carried out on the termination of employment and upon request of the employee, the absence of alcohol dependence, drug consumption and use of psychotropic substances for all potentially hazardous tasks (to the worker and to the others) as described in Circular 16 March 2006 and State-Region Agreement of 30/10/2007 (13).
Periodic medical examinations should be also intended to promote health and work skills through a number of suggestions (correct behaviour in the workplace, lifestyle and health-promoting daily habits, the inclusion in the workplace health promotion activities; early identification of changes in the worker's health conditions or working capacity and consequent treatment and rehabilitation) but subject to the explicit and informed consent of the worker directly involved in such investigations (2,14).
Health surveillance medical examinations are meant to assess the compatibility of the task assigned to the worker; therefore, based on the results obtained, the occupational health physician will set out one of the following opinions:

- fitness on the specific task (without the need for any corrective measures in the working environment and work organization);
- fitness to the specific task with contraindications (whenever exposure to specific risks can only be allowed provided special precautions are adopted for workers particularly susceptible to those risks);
- fitness to the specific task with restrictions (whenever a number of tasks assigned are excluded);
- partial, temporary or permanent fitness;
- temporary or permanent unfitness as a result of

pathological conditions not allowing the task to be carried out;
- in the case of temporary unfitness, the time limits will have to be specified. Whereas, in the case of permanent unfitness, the employer will have to assign the employee, if possible, to a different task compatible with the original one and which he/she is fit for; should the worker be assigned to a lower-level qualification task, he/she will nevertheless be recognized the same remuneration as well as keeping the same qualification related to the prior task (2).

In all the cases mentioned above, medical examinations should be required taking into due account their accuracy, relevance, necessity, consequences and acceptability in the light of scientific, ethical and social considerations (15-17). Furthermore, such investigations must be conducted in full compliance with the decision-making power of the worker, who is entitled to express his/her informed consent prior to any medical examination whatsoever; however, the fact that the worker has given his/her informed consent does not imply that any medical investigation is to be admitted from an ethical and legal point of view.

Occupational health professionals are expected and required to interpret the clinical data in a broader context by taking into account not only the requirements and working conditions but also the possibility of further primary prevention and/or health surveillance measures in order to avoid any damage to health (14). This professional approach will allow occupational doctors to:
- maximize the likelihood to identify the occupational hazards;
- recommend to employers and safety managers the most appropriate preventive measures for a better and safer working environment and for tasks more suitable to the workers' requirements;
- properly explain to employees the characteristics of an optimal work environment;
- reduce the number of employees not admitted to work on health-related grounds.

A proper evaluation of the practical and scientific relevance of clinical and biological investigations carried out on workers requires the compliance with at least two criteria: the recourse to extremely reliable scientific data, which should exclude tests (including the genetic ones) used only for commercial interests, as well as the assurance that the decision has the sole purpose of protecting the health of those involved (17).

The results of clinical investigations, carried out for health surveillance purposes, are to be considered medical data and therefore they cannot be shared with third parties unless the person concerned has explicitly consented to it or based on legal decisions clearly allowing or requiring to share such data. Should the results of investigations carried out be used for research purposes in the light of the role they may play in enhancing the working population safety and protection, their confidentiality and privacy will in any case have to be ensured. Moreover, the medical officer should inform the employer of the results of the investigations a worker has been submitted to insofar as they are designed to assess his/her fitness to specific tasks or to establish the presence of specific restrictions/limitations; the medical officer is required to notify the results according to definite and clear procedures, generally complying to specific national regulations, in view of safeguarding the worker's privacy (14,17).

The main purpose of health surveillance, as also specified by the International Labour Organization, is the prevention of occupational or work-related accidents and diseases. It is carried out and ensured by the occupational health physician, who is expected to inspire his/her professional conduct to ethical and good practices principles and always taking into due account the legal aspects to ensure that these issues are professionally addressed and that the worker's freedom and dignity are properly safeguarded (15,18).

All the measures envisaged and implemented by the occupational physician are considered good quality if they go far enough in improving the workers' health conditions or in reducing health risks (effectiveness), if they make use of the existing know-how and technology, within the limits of the available resources (efficiency), if they are able to meet in a fair and appropriate way the needs of both the individuals and the community (fairness), if they respect the ethical principles supported by the individual, the community and society at a given point in history (ethics) and if they fully satisfy all the parties involved (15,17,19-21).

When choosing between the different options available in a health surveillance perspective in view of protecting the workers' health, the physician must: evaluate the appropriateness (effectiveness and efficiency) of the measure; comply with the ethical principles and laws; make a conscientious (supported by scientific evidence), judicious (supported by guidelines and recommendations) and explicit (demonstrating that their decisions are well-founded) use of the information available and be inspired by principles of beneficence (each measure shall contribute to the individual's welfare and will not do harm), autonomy (respecting the decision-making power of the individual) and justice (fairness and non-discrimination) (9,17,22).

Health surveillance is the tool to meet one of the basic priorities for the occupational physician, notably the prevention of accidents at work: indeed, the evaluation of the likelihood that an accident may occur and the contribution to explain its causes/risk factors may be used to work out specific preventive programs and to evaluate their effectiveness (2). This means that the collection, analysis and reporting of data related to the health of the workers should, in theory, have an impact on the working environment and working conditions as well as on the health and livelihoods (work safety/income ratio) of workers. Therefore, in order to prevent workplace accidents, the occupational physician should develop a methodology taking into account a whole range of factors, including the personal ones, which can be correlated to the risk to be injured (9).

A comprehensive and coherent system of health surveillance should:

- include an evaluation of the individual and collective state of health, recording and notification of occupational accidents, notification of "sentinel events", inquiries, surveys and inspections;
- describe the health conditions of the working population and socio-economic groups, by studying occupational accidents and diseases and work-related pathologic events (frequency, severity, mortality and morbidity rate, complaints, working conditions as witnessed by workers);
- encourage epidemiologic studies to identify and explain the adverse health effects of causal factors related to physical, behavioural, organizational, psychological and occupational factors;
- predict the occurrence of work-related events constituting a risk for health and develop early warning and alert systems;
- prepare worker-oriented intervention and research studies, so as to eliminate any causal factors through prevention;
- assess the effectiveness of the control measures previously implemented;
- give companies guidelines on occupational health policies and programs, including information on how to raise funds for their implementation (2,9).

Health surveillance and occupational injuries

Occupational injuries are an extremely complex phenomenon and the risk to be injured is the result of a critical interaction between workers' health, lifestyle, behavioral attitudes, work organization, workplace practices and equipment, type of occupational exposures as well as the legislative, economic, demographic and cultural context. In general, occupational injuries can be considered as the result of the interaction between extrinsic factors (technical, organizational and social deficiencies associated with the work environment) and intrinsic factors (i.e. behavioural and influenced by the worker's state of health and therefore related to the individual). The human factor can be considered as the main component in the causes of occupational injuries (22). By definition, the term human factors covers a wide range of elements relevant to the worker-environment combination so that it does not simply refer to a single physical or psychological characteristic of the worker but to all those human behaviors often involved in the sequence of events leading to the injury: it has been estimated that human error is involved in 90% of occupational injuries. This explains why the human factor should be the main target of preventive strategies (23-25). Actually, we cannot fail to notice that several methodological limitations and practical considerations do not always allow for reliable conclusions to be directly applied to the company or the employee as well as there are potentially endless human-environment interactions and the role of the various factors is not always easy to predict. This infinite number of combinations poses a serious challenge to the physician in charge, when he/she is committed to preventing occupational injuries through health surveillance (25).

Below are some of the factors associated with a higher likelihood of injury:

- high number of working hours (> 8-9 hours);
- night shift;
- fatigue and need to rest;
- young age;
- male gender;
- ethnic factors;
- alcohol consumption;
- smoking bahaviour;
- diet;
- drug abuse;
- manual work;
- medication use/abuse (for example hypnotics);
- general health conditions;
- sleep disorders;
- obesity;
- musculo-skeletal disorders;
- sensory deficits (especially the visual and hearing impairments);
- illnesses and their treatment (i.e. psychiatric disorders, neurological diseases, cardiovascular diseases, balance disorders, endocrine disorders such as diabetes);
- inexperience and/or scant knowledge of the task assigned;
- positive anamnesis for previous work-related injuries;
- stressors;
- psychophysical workload;
- motor abilities;
- personal characteristics (education, general attitude, emotional stability, knowledge, experience, attention, self-confidence, motivation, communication skills, workplace safety awareness, risk behaviours);
- work factors (related to the tasks, working environment, posture, tools and equipment used, work organization, ergonomic principles applied, etc.) (22-30).

The impact of these factors on workplace accidents varies greatly based on the age groups: for example, sensory and cognitive deficits, which may affect the physical, mental and intellectual capacity of workers, are more frequent occurrences in the older age groups just as obesity and musculoskeletal disorders (≥45 years); on the contrary, young adults (≤30 years) are more exposed to the risk of injuries related to their limited knowledge of the task assigned and little work experience. There are, however, also elements likely to favor the occurrence of injuriies regardless of the age groups (for example, male gender, smoking and alcohol abuse) (25).

In the light of the above it clearly appears that a wide range of work factors along with the type of lifestyle deeply affect accident rates. Moreover, it is necessary to differentiate, among these factors, two kinds of accident predictors: causal risk factors and risk markers; while the latter help identify the individuals, groups of

workers and workplaces exposed to risk and cannot be changed (for example, age, sex, etc.), the former are subject to change and can, therefore, be referred to for the implementation of preventive actions. In conclusion, the prevention of occupational accidents should include technical interventions related to work equipment and environments, administrative actions (organizational, procedural and insurance adaptation strategies) and behavioral interventions to be implemented through health surveillance (encouraging a healthy and correct lifestyle). Moreover, awareness of which risk factors are more closely associated to the various age groups could enable the implementation of better targeted preventive measures and programs (25,31-33).

The occupational physician can rely on a wide range of professional tools to investigate into and assess the above mentioned factors, notably: medical history, physical examination, laboratory tests, radiological investigations and specialist medical advice.

The history-taking should be conducted systematically and be as complete as possible; the physician must therefore devote all the time necessary to gather information about the employee's personal, work and medical history, especially in the course of preventive examinations: general socio-demographic aspects, lifestyle, general and specific medical records, occupational history. This course of action must be complemented by a complete, thorough and rigorous physical exam that, if well conducted, enables identification of the signs associated to various diseases and pathological conditions, such as alcoholism, preservation or deterioration of hearing and visual capacities, impaired balance and posture control, altered neurological tests, lower back pain, etc. The occupational physician can also, where deemed appropriate, make use of diagnostic and/or radiology tests and consult with other professionals; indeed, the occupational physician should fully assess the clinical condition of the worker and be fully aware of any impairment, functional limitation, disability, medicines prescribed and their side effects, prognosis, therapies used and their implications in the life of the worker, whatever his/her disease may be (2).

It might be useful to develop workplace accident statistics based on a number of different variables, such as age, sex, national origin, work duration, diagnosis, therapies, limitations, sick leave, biological monitoring, alcohol consumption, psychosocial factors, occupational history, etc. (9,34).

Health surveillance must lead to the formulation of the fit for work assessment, which should be conducted in full compliance with the technical and ethical guidelines governing the activities of occupational health professionals. This is especially true where the health of a worker, and hence the task for which he/she is declared fit, may have repercussions not only on the health and safety of the worker but also of his/her colleagues and/or of the community in general; therefore, for certain high-risk tasks, the fit for work assessment should be formulated in accordance with and taking into account the highest assessment standards.

Another relevant aspect of health surveillance is the use of the appropriate Personal Protective Equipment (PPE): this requires a careful and accurate consideration, on the part of the occupational physician, of the worker's state of health as well as a thorough knowledge of PPE characteristics so as to determine the most appropriate type of PPE needed for a job task (2).

Another critical issue of health surveillance refers to the medical examination prior to resuming duties, following an absence for health reasons (injury or disease) in order to ascertain whether the worker is still fit to perform the job. It is a critical period in the life of a worker; therefore, the physician in charge should be able to assess the worker's residual functional capacity, have a clear idea as to the time and the specific recovery needs based on the clinical condition of the worker, his/her skills and role and support him/her by offering a pathway back to work.

In the case of absence from work due to injury, all the efforts of the occupational physician should be aimed at preventing the occurrence of a second injury, experience having shown that there is a high percentage of injured workers likely to suffer from a new harmful event after returning to work (33). It is important to bear in mind that any disability and return to work following injury are greatly influenced by several variables concerning the psycho-physical characteristics of each worker, type of injury, healthcare and rehabilitation system, physician-patient relationship, clinical case management by physician, vocational training, invalidity insurance system (particularly with regard to workers' compensation), organization and psychosocial/ physical characteristics of the work done, improvements in the working environment and company-related factors (e.g. employer, job role, discrimination, legal framework, labor market characteristics) (17,35-37). In this respect, we could more specifically recognize seven groups of factors, influencing the duration of post-injury disability, to be taken into account during the medical examination prior to resuming duties:

- individual characteristics, including: socio-demographic factors (e.g. age, gender, marital status, economic conditions, etc.), psychological factors (hypochondria, anxiety, depression, history of childhood abuse, etc.), attitudes and beliefs (personal perception of disability, understanding medical history, etc.), lifestyle (smoking behaviour), clinical parameters (comorbidities, psychosomatic disorders, etc.);
- accident descriptors (severity, diagnosis, body part involved, pain intensity and possible irradiation, etc.);
- medical and professional rehabilitation schemes;
- physical and psycho-social characteristics of work, namely: physical factors (heavy physical work, repetitive or continuous stress, muscle strain, awkward working positions, exposure to noise, etc.), psychosocial factors (stress, job dissatisfaction, control the work performed, a high number of working hours, shift work, etc.) and social support

(from colleagues and supervisors);
- organizational work factors, (employee-focused culture, implementation of disability management schemes, ergonomic projects, etc.);
- disability prevention and management schemes by employers and/or insurance companies (change of duties, early notification of accidents, rest periods, workplace therapeutic programs, active monitoring of injured workers by insurance companies, implementation of ergonomics programs, etc.);
- company-related factors in the area of social policy and macroeconomics and legislative framework (cause, complexity of the workers' compensation system, employee benefits, wages benefits, etc.).

As a matter of fact, recent studies have revealed that, following an occupational injury, the worker is unlikely to receive appropriate and coordinated medical care, he/she is not supported and assisted by the employer when resuming his/her duties, compensation claims are not managed satisfactorily and information relevant to the task performed, to re-injury risk and the proper conditions to facilitate return to work often fail to be appropriately disclosed or discussed.

The occupational physician called upon to carry out health surveillance programs should be able to promote healthy eating and proper lifestyle habits, giving advice on the proper use of medicines and responsible drinking, recommending to take breaks while driving, teaching the workers how to recognize the risk factors and the warning signs likely to slow reflexes while driving (37).

In conclusion, the role of the occupational physician can be considered really complete when, as a result of his/her intervention, it is possible to identify the proper work activities and work schedules, launch work reintegration strategies, prescribe specific PPE, promote additional training and occupational rehabilitation and provide medical and psychological care. But what is really crucial and could really make a difference is that this should be put into practice before the accident occurs, by identifying specific reintegration pathways together with the implementation of more flexible work activities as well as through the creation of specific rehabilitation and re-employment schemes, always focused on the health and safety of workers and third parties.

Occupational accidents have quite a number of economic and health consequences, related to the individual (worker), businesses and the community, among which: the provision of healthcare services for the damage suffered, functional impairment and disability, days off work, work restrictions, a reduction of working capacity and of work-related skills, changes in the relationship with the employer and colleagues, need for retraining, loss of productivity, costs of insurance and other administrative tasks for injured workers, damaged equipment, the social consequences related to the quality of life, the behavioral and psychological reactions, social participation, interpersonal relations, household dynamics and domestic activities (33,37).

Given its multifactorial etiology, occupational accident prevention should be based on a multidisciplinary intervention, which entails the involvement of different figures (insurance agents, public institutions, employers, workers and trade unions, engineers, sociologists, experts in ergonomics and, of course, occupational health professionals) (8,38). Moreover, occupational injuries could constitute, due to their nature, a valid indicator to measure how the prevention, health and safety system is organized in the company and, therefore, a potential indicator as to the effectiveness of prevention schemes implemented in the workplace (34). Occupational health professionals should always demonstrate the effectiveness of their interventions, which can be done through a number of measurable indicators (e.g. time required to return to work, duration of work inability, absenteeism, psychosocial factors, fit for work assessment after an injury, etc.); this approach is not designed to produce statistically relevant results but rather to demonstrate that the action taken may affect the causes and circumstances of accidents thus decreasing the rate of workplace injuries and that such interventions prove beneficial also from a cost-effectiveness point of view (33,34).

The skills of the occupational health physician in the field of accident prevention should include:
- identification, assessment and monitoring of risks to health from hazards in the workplace;
- accident analysis;
- advice on a wide range of occupational health matters in the workplace ranging from hygiene, safety and ergonomics and on personal and collective protective equipment;
- first aid and emergency organization and management;
- recommendations related to work planning and organization (for example workplace design, selection and maintenance of machinery and equipment, choice of materials used, introduction of new working systems and new technologies, etc.);
- participation in the formulation of company policies for health and safety in the workplace developed according to ethical principles and legislative regulations;
- knowledge of specific legislative directives and regulations governing the employee fitness for work and work adjustment under certain conditions (the disabled, pregnant women, etc.);
- participation in workplace health and safety promotion programs (focused on ethical issues related to health screening; cost/benefits analysis of health and safety promotion activities; stimulating workers' and employers' involvement in the development and evaluation of workplace health and safety promotion programs, evaluation and update of workplace health and safety promotion programs, especially as concerns specific occupational risks and control of non-occupational factors affecting state of health and work skills);
- promotion of workplace adjustment measures;
- assessment of disabilities and fitness for work;
- work skills promotion;

- management of alcohol- and/or drug-related issues in the workplace;
- active involvement in information, training and educational programs related to workplace health, safety and ergonomics issues;
- evaluation of post-injury fitness for work;
- follow-up visits of injured workers;
- workers rehabilitation (clinical management, psychological support, workplace ergonomics improvements, etc.);
- workers redeployment;
- contribution to scientific knowledge coming from research and investigations in the field of occupational health problems.

Furthermore, as already mentioned, the occupational health physician is required to have and seek to expand his/her clinical skills and culture as well as his/her knowledge of accident-related issues so that he/she is actually able to:

- diagnose and treat work-related injuries and illnesses according to the highest quality standards;
- give advice on workers protection, taking into proper account any risk and hazardous exposure in the work environment;
- recommend best practices in providing medical care in the interest of facilitating functional recovery and return to work;
- collect a detailed medical history, with a particular focus on characteristics of the task assigned;
- perform a full and targeted physical examination;
- select the appropriate diagnostic tests and tools;
- recognize the possible connection between health damage and occupational exposure;
- identify the non-occupational factors which may represent potential causes of workplace injuries and occupational diseases;
- require follow-up visits after workplace injuries or occupational diseases;
- establish therapeutic relationships with the workers, including risk communication;
- inform the workers of the results of the medical exams and tests they have undergone.

The occupational physician has undoubtedly a crucial role to play in terms of prevention, nonetheless there are a number of problems to take into account. First, the role of the occupational physician fails to be given proper consideration in manuals and publications for experts in this field; moreover, investments in safety and accidents prevention are not as conspicuous as those reserved to occupational diseases. It has likewise been observed a self-imposed exclusion attitude from accidents prevention and management, for cultural and practical reasons; at the same time, at the highest management levels, the intervention of the occupational physician is not required as his/her role tends to be simply associated to the daily and routine health surveillance activities (39). The same can be said in the case of labor inspectors or local authorities responsible for overseeing workplace health and safety issues who are reluctant to consult occupational physicians.

Moreover, the approach to accident prevention in the workplace is based on descriptive statistics, technical interventions on equipment and compliance with administrative duties. Further critical issues, besides those mentioned above, are:

- poor knowledge of the issue;
- lack of motivation;
- poor professional training and skills;
- critical health surveillance (a lack of attention given to work-related injuries; inadequate record keeping of accident-related and -relevant data in medical records).

As a matter of fact, in the light of today's work reality, the occupational physician may have multiple opportunities to intervene to prevent accidents and control risks in the workplace through risk assessment, health surveillance, formulation of fitness-to-work judgments, health education, first aid, work organization, supervision, information and training of workers, and scientific research (8,38).

Risk assessment which, by definition, is the process of identifying and evaluating risk, combined with the likelihood that an adverse health effect may result from exposure to certain conditions, is the most important preventive action in the workplace: thanks to risk assessment it is possible to lay the foundations for proper work planning and organization and for the adoption of measures capable of ensuring a safe and healthy working environment. Risks recognition, their origin and potential impact on health and safety as well as strategies to minimize risks are core competencies required from occupational physicians: risk management is, indeed, a crucial point for occupational medicine since it focuses on individual safety, on health threats and risks for the community.

The starting point of the risk assessment process in accident prevention is data collection and retention, which the occupational physician should carry out in collaboration with the employer. The problem, however, is that in most cases the data collected describe the type of injury, the date and time of accident and other information which appear to be more useful for administrative purposes than for real preventive and valuable purposes. This is why it would be advisable to collect more detailed information describing the circumstances of the accident, i.e. role of machinery, equipment, protective equipment, any exposure, etc. In so doing, the occupational physician is recommended to maintain an impartial attitude with respect to liability issues, and contribute, instead, to create a relaxing atmosphere where the error should be seen as an opportunity for improvement. Moreover, the occupational physician should also request the recording and suitable reporting of the so-called near misses, which represent a warning and thus an opportunity to prevent the occurrence of more serious events.

Over time, the employer/client combination has crept into the doctor-patient relationship as a third party and as the actor responsible for working conditions potentially harmful to the health of workers. This means that occupational medicine professionals are today confronted and have to deal with the economic interests of the companies, on the one hand, and the right to

work and health of workers on the other. This implies that the guiding principles of policies on health protection in the workplace should ensure a better working environment as well as task adjustment, so that every worker with the right skills may virtually be in a condition of performing the various tasks in complete safety and without risk for their own and the other people's safety, thus ensuring that no one is assigned to a task he/she could not perform because of his/her health conditions.

The complex network of responsibility that permeates the activity of occupational medicine professionals with respect to workers, employers, the community, the competent authorities and other institutions, has resulted in the conviction that ethics must form the basis of Occupational Medicine practice (15). Ethical and moral challenges are part of the daily practice of occupational medicine even if, in reality, no problems should arise in case the conduct of the company doctor is inspired to laws and regulations; common civic values; professional knowledge and skills; personal values. Ethical awareness and implementation of the guiding principles inspiring ethical conduct of occupational medicine professionals is strictly associated to and derives from the cultural and social background in which they perform their duties and activities (15).

Ethical codes are generally intended as guidelines for the conduct of professionals, nonetheless a number of problems may arise mainly related to interpretation, multiplicity and legislation issues (15,17,18). Interpretation problems are due to the ever-present and inevitable distance between abstract general principles and real life; moreover, these guidelines contain internal contradictions that make them difficult to interpret. The multiplicity problems are a consequence of the plethora of codes of ethics and guidelines which, not infrequently, head in opposite directions. The essentially "legal" form of codes is, instead, what lies behind the legislative problems: when an ethical issue is interpreted as a legal problem, this could generate a moral risk, even because occupational health professionals and researchers are generally not prepared for the interpretation of legal regulations, which, of course, has a detrimental effect on the responsibilities of occupational health physicians (15).

Notwithstanding the above-mentioned ethical-related issues, codes of ethics also have a number of positive aspects worth mentioning, and notably:

- they describe accepted/acceptable behaviours;
- they promote high good practices standards;
- they provide precious reference points which can be used for self-assessment purposes;
- they establish the guidelines of professional conduct and responsibilities;
- they represent a vehicle for occupational identity;
- they are a sign of professional maturity.

In general terms, professional independence, impartiality, respect for the workers privacy and for the confidentiality of health data should guide the conduct of occupational physicians responsible for health surveillance, or better said, they should:

- respect the confidentiality of health data: the employer is not entitled to receive any confidential information on the health of workers insofar as it is not necessary to establish the worker's fitness for work;
- obtain the explicit informed consent of the worker before releasing confidential health-related information to third parties;
- pay attention to potential conflicts of interest arising from the protection of the rights of a worker, on the one hand, and, on the other, of those of the employer;
- treat with special care the processing, preservation and transfer of data on the health of workers to avoid that confidential information is disclosed to unauthorized people;
- recommend health surveillance programs and services with a special focus on the cost/effectiveness aspects;
- make decisions based on the best and latest scientific evidence and guided by professional experience;
- perform duties and activities within the boundaries of their competence, refraining from making judgments on issues outside their professional sphere;
- keep their skills and knowledge constantly updated in order to assure the highest quality standards in their work;
- keep all information on production, work organization and documentation of working conditions as confidential material, unless its disclosure is clearly authorized or is public domain material;
- recognize and respect the ethical needs of other professional groups whose involvement and collaboration might be required, with a special focus, especially in the case of non-medical experts, to avoid any violations of privacy that could affect the worker's employment relations;
- recognize the need to safeguard their professional independence with respect to clients, customers and the other involved parties, even with the introduction of a contractual clause on professional ethics.

The ethical principles underlying the action of the occupational physician in charge of health surveillance are embodied in several documents, including the ICOH (International Commission on Occupational Health) Code of Ethics and Standards of Professional Conduct for Occupational Health professionals, the Code of Medical Deontology of the National Federation of the Order of Physicians, Surgeons and Dentists and the ILO (International Labour Office) Technical and Ethical Guidelines for workers' health surveillance (14,15,18,40,41).

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