

ORIGINAL ARTICLE

Prevention in the workplace and training of personnel: new methodological approaches

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Key words

Prevention • Learning training • Nurse staff

Summary

In Italy since 15 years huge investments in term of human, material and economical resources have been allocated to prevention. However epidemiological data show unsatisfactory results. It's necessary and urgent to modify the general learning of prevention in order to increase all the actors involved in social and productive system.

The aim of our project is to improve competencies and knowledge concerning hygiene in the workplace and prevention of nursing personnel, using cooperative-learning model, concerning the

ways of transmission of infectious diseases, so that they will be able to develop their activities and being motivated in the adoption of safety proceedings.

The results indicate, in all the participants groups, an improvement of their skills and knowledge about the correct behavioural procedures to limit biological hazards for themselves and for their patients. We observed increased motivation and awareness, a greater ability to take action when they see the adoption of inadequate or incorrect procedures by colleagues.

Introduction

In our country since 15 years huge investments in term of human, material and economical resources have been allocated to prevention. To achieve this, several intervention in term of laws, organization, equipments and training in order to reduce death and accident in workplaces. However epidemiological data show unsatisfactory results.

Over 50% of accidents biohazard is in hospital (between 1994 and 2003 there were 41000 exposures) [1]. The literature data are sparse and conflicting: 87% of exposures concerning doctors of which 33% in hospital and other studies, 72% in Italy about the nurses [2].

Moreover, for example percutaneous injury from hollow-bore blood-filled sharp objects is the primary route through which healthcare workers occupationally acquire blood-borne and potential fatal diseases. It is estimated that there are 1 million needlestick injuries in Europe annually [3, 4]. The results demonstrate that it is strictly necessary and urgent to modify the general learning of Prevention in order to increase all the actors involved in social and productive system. The recent Decree Law 81 of 2008 stipulates, as before the Legislative Decree 626/94, the need to train workers. The most important goal in safety training and prevention in the workplace is the maximum reduction of accidents and professional illness at work through the acquisition of worker's knowledge, skills and correct behaviour, especially in the services sector. In fact, after the record low of accidents in 2009 (- 20.4%) partly due to the effects of the current difficult economic times, in 2010 the

threshold of workplace fatalities has dropped below one thousand cases, indicating improvement of the accident in Italy. The service sector, however, showed a substantial stability of accidents (+0.4%) and a reduction of 3% of fatal accidents.

There are many factors responsible for this current situation: we think that one of the most important of these factors is the lack of motivation of workers regarding the prevention in workplace.

Safety education is the result not only of learning concepts and technical expertise, but also the ability to understand how this knowledge are assimilated and interpreted by the subject during the educational training.

These issues are central to influence the behaviours and work environment: it is important to remember that all behaviour is the result of complex interactions involving personality, appearance, professionalism, motivation, work environment, social network, and that these coping variables cannot be ignored, even in training [5-7].

As individual behaviour and social context are the result of reciprocal interactions, it was necessary to leave an interpretation based on individual variables for the analysis of context and, lastly, an interpretation based on a systemic model to explain accidents at work [8]. Aim of this work is to make the operator aware of the actions that should be implemented through the evidence. Then, the operator shall take the relevant measures to avoid the biological behaviour towards themselves, other professionals and patients.

In order to plan a proper and effective didactic project we think that it is also necessary to consider that every behaviour is the result of complex interactions between

personality factors, beliefs, motivation, work and social contexts and previous experiences.

In our clinical context, the instrumentation and methodology used in training have a central role: their efficacy would be improved if the trainer knew how to use efficient technologies to promote individual skills and competencies through learning; safeguarding procedure, evaluation and interpretation of training results [9, 10]. Unfortunately, the traditional approach to inform workers about prevention and safety has not proven to be effective. For this reason we have integrated, in our training, a cooperative learning model [11, 12] in safety prevention. The cooperative learning's methodology, helpful in the training of adults is in fact a method little used in Italy, especially in hospital care settings [13, 14], in particular on security and prevention of biological risks.

The objective of our proposal is to detail a training design in the health context, which can be applied in any similar context.

Materials and methods

Our work started with the analysis for the needs of Community health, divided into 3 general hospitals and 2 rehabilitation hospitals with 3.400 employers, in a country near Alessandria (Italy).

Four years ago (2008), groups with profound experience in all fields evaluated risks inside the hospitals so that a Safety Certification according to Occupational Health and Safety Assessment Series (OHSAS) 18001 could be issued.

Data pointed out that not all Operative Units had operative proceedings concerning staff (nursing personnel) and patients' biological risks. In relation to data

Tab. I. Participants.

| Classes | Participant | Males | Females |
|---------|-------------|-------|---------|
| 10 | 80 | 27 | 53 |

Tab. II. Learning phases and time.

| Step | Time | Topics to be developed |
|------|--------|--|
| 1 | 45 min | <ul style="list-style-type: none"> • Explanation of the mandate through a conceptual map • Presentation of the cooperative learning model and the expected behavior • Definition of the components of the various groups |
| | 15 min | Formation of groups, assigning roles and the presentation of the specific task. All groups: to define what "Standard Precautions" are. |
| | 50 min | Conduct of work by members of the groups Phase of monitoring by the teacher and completing the monitoring processes of interaction |
| | 10 min | Fase processing |
| | 95 min | Conduct of work by members of the groups Phase of monitoring by the teacher and completing the monitoring processes of interaction |
| 2 | 15 min | Formation of groups, assigning roles and presentation of the specific task: <ul style="list-style-type: none"> • All groups: further definition in detail of what "Standard Precautions" are • Group 1: Define the most common symptoms of diseases transmitted through "droplets" • Group 2: Define the symptoms of common diseases with airborne transmission • Group 3: Define the most common symptoms of diseases transmitted by contact. |
| | 95 min | Conduct of work by members of the groups Phase of monitoring by the teacher and completing the monitoring processes of interaction |
| | 10 min | Fase processing |
| 3 | 15 min | Formation of groups, assigning roles and the presentation of the specific task. <ul style="list-style-type: none"> • Group 1: Define the most common symptoms of diseases transmitted through "droplets" • Group 2: Define the symptoms of common diseases with airborne transmission • Group 3: Define the most common symptoms of diseases transmitted by contact |
| | 95 min | Conduct of work by members of the groups Phase of monitoring by the teacher and completing the monitoring processes of interaction |
| 4 | 15 min | <ul style="list-style-type: none"> • Group 1: Define the precautions based on "droplets transmission" • Group 2: Define the precautions based on "airborne precautions" • Group 3: Define the precautions based on transmission "contact precautions" |
| | 95 min | Conduct of work by members of the groups Phase of monitoring by the teacher and completing the monitoring processes of interaction |
| | 10 min | Fase processing |
| 5 | 90 min | Training groups and plenary presentation of work in giving space to the considerations and questions from participants. The teacher moderates the stage. <ul style="list-style-type: none"> • Stage of processing • Considerations on how the approach of Cooperative Learning on the part of learners |

obtained, in the following year (2009) we have decided to implement a training program to standardize the behaviours related to biological risk in the three services of the hospital emergency room.

The aim of the current project here described is to improve competencies and knowledge concerning hygiene (nursing staff) in the workplace and prevention of the personnel, so that they will be able to develop their activities, but also being motivated in the adoption of safety proceedings inside their own Operative Unit. This project was inserted in "improvement groups", related to continuing education in Medicine (ECM).

The target definition is addressed to nurse staff in three Operative Units of the Emergency Room located inside the hospital. The staff's job consists of emergency interventions (during triage) and they must be able to diagnose, immediately and opportunely, the symptoms, related to infectious diseases, and know how to procedure.

Times and participants

The training project was carried out in six months and it has requested a detailed organization in subgroups of the staff involved. This choice is necessary to avoid disorganization among Operative Units (because for the project were made 5 meetings divided into 2 hours length, for the all 80 participants). The groups were formed in relation to the ability of individual participants to carry out literature search on line, constructing homogeneous groups.

The learning activities were organized as shown in the Table II.

The training

During the training sessions the need to concentrate a short period of time with a large volume of knowledge is achieved.

In order to optimize all of the fundamental topics the web was implemented to search for general knowledge as well as scientific articles to start up learning processes and cooperative skills.

For the definition of educational objectives, this work has followed Guilbert's claims [15]; for this author a good goal should be:

1. relevant (reference should be made in order to be achieved);
2. logical (not to have internal contradictions);
3. accurate (define precisely the skills that a participant has acquired);
4. achievable (in the cultural context in which it is addressed and operational);
5. observable (you can see how you can reach a goal is the requirement to assess the achievement);
6. measurable (measures to achieve a goal is the basis for the evaluation of a training event).

On the basis of Guilbert's claims and in relation to cooperative learning teaching-learning method [15], chosen for this project, we selected two types of targets: teaching and learning goal and cooperative goals, where the latter are tied to the operating rules of the groups in training.

1) Teaching and learning goals (to be achieved at the end of the course) were the following:

- a) *Intellectual capabilities*
 - to know how to describe why it is useful to apply prevention proceedings towards patients with suspicious or certain diagnosis of infectious disease;
 - to know how to evaluate, during the triage, the symptoms of infectious disease;
 - to know the route of transmission of the main infectious diseases;
 - to know the universal, standard and transfer precautions according to the CDC of Atlanta.
- b) *Gestual capabilities*
 - to be able to identify the individual protection devices for protection required and implement correct use;
 - to be able to put into practice the CDC's precautions;
 - to put into effect the correct ways of patient isolation.
- c) *Interpersonal communication*
 - to have adequate motivation to reach in planning and adopting proceedings;
 - to demonstrate to be interested in the proceedings selected;
 - to have adequate motivation in advertising proceedings among colleagues.

2) Cooperative goals

In addition to teaching and learning goals it is also very important to establish cooperative goals.

According to Johnson, Johnson, Smith and Johnson, Johnson [16, 17] a skill trainer must give not only a cooperative context to the students but also four levels of "cooperative skills". They are the following:

a) *Ability and behaviours useful in the formation of a group (forming).*

The basilar rules and capabilities are very important to form a work group, for example:

- forming a group shortly, without disturbing others, and without noise and waste of time;
- don't speak aloud;
- staying in the work group during the work;
- don't monopolize discussion interventions and let's all/everyone participate.

b) *Ability and behaviour useful to improve the functioning of a work group (functioning).*

If we want the good functioning of a learning group, it is required a second level of capability. For example:

- listen and share opinions and ideas;
- ask questions;
- correct/adjust the different points of view and /or information given by others;
- show the right direction /way to a workgroup if we want the goal to be achieved (that is: remember, look over the goal to be achieved, to remind the time at your disposal to complete your "work", to underline

if the proceeding is right or wrong, it is necessary for a good work development improvement;

- to encourage the participation, to ask for help, to ask for a clarification;
- to express *in a verbal or non verbal way* and find support and acceptance from all the members of the cooperative group;
- to offer own explanation;
- to paraphrase;
- to motivate the work group with the demonstration of enthusiasm and energizing who is little incentive;
- to express own negative or positive feelings during the development of a work of a work group).

c) *Ability and behaviour to improve the elaboration of contents (formulating)*

Formulating capability are knowledge abilities that lead to a deep knowledge of the subject about:

- to resume;
- to correct mistakes or omissions;
- to underline the importance of some aspects or information that others don't take into due consideration;
- to find links between what you are going to know and what you already know about;
- to draft / to elaborate strategies;
- to discuss another subject;
- to ask to plan together.

d) *Abilities and behaviour for skill enhancement (fermenting)*

This 4th level collects all social abilities and competences that lead to a deep research of the subjects looking for the reasons that *defend or not a thesis*, to be creative, to discuss widely;”.

Let's see investigation competences:

- to criticize ideas and not people;
- to make difference between ideas and reasons according to staff;
- to incorporate all ideas to become a single one;
- to require to justify an assertion/statement;
- to widen interventions or answers;
- to ask questions requiring the argument to be discussed deeply;
- to formulate new questions concerning conclusions achieved;
- to make interventions checking the feasibility of what you have decided, what you have found.

Distribution of the skills

The first training session deals with interviewing the subjects about their abilities in using computers and about researching on websites and by scientific research.

A well composed group of different professionals with little, average, or extensive knowledge in computers, and database.

According to research, a heterogeneous group defines a positive experience that promotes: public relations, cohesion/ fusion, social knowledge, responsibility, self-esteem, self motivation, self-efficacy [5-7, 16]. In addition, the heterogeneity allows the comparison of vari-

ous experiences according to an inductive approach: to resolve a problem which comes out during the activity. The group must be able to reflect on the origins and the consequences in order to find adequate solutions on the basis of different problems [18].

Defining and assigning roles

The assignment of roles is a very important phase in the functioning of a cooperative group: Cohen explains how the roles are “responsible for the success of the project”. Furthermore, “The roles define what other group members expect from a student (and therefore what the student is required to do) and what that person is entitled to expect from their fellow group” [19].

The task of the trainer during the assignment of roles is to explain what the role is and how to enact it in the best way.

During group discussion, each component has the responsibility to consider issues that are raised by another member and that are important or relevant to the role it has. Each group member should feel an obligation to help the group to work effectively, without wasting time.

In a group of three people, each member has one of the following roles: 1) leader, 2) skeptic, 3) controller. It must provide students with a blueprint for defining responsibilities and a discussion guide for discussion

1) LEADER / COORDINATOR

The responsibilities of the coordinator are:

- to organize group activities;
- to oversee and facilitate the group discussion;
- to maintain the group's attention focusing on the result of the task; to encourage the group to face a series of stages; to encourage the participation of all group members in problem solving.

2) SKEPTIC

The skeptic often questions the procedure of problem solving, looking for explanations and evaluations. The skeptic is not satisfied with “yes” or “no”, but reminds the group that the emphasis should be placed on the “why” or “how” of the relationship with information using previously known algorithms.

It is the task of the skeptic to stimulate the group in search of alternatives.

The responsibilities of the skeptic are:

- to ask questions about why to perform a certain passage or to follow a particular direction in an attempt to solve the problem; to think and propose alternative solutions to the problem.

3) CONTROLLER

The responsibilities of the controller are:

- to consider all data and information from the given materials in question;
- to keep track of group discussions;

- to prepare an official version “of the procedure that will be discussed” with participants from other groups.

In the case of a group of four participants, a further role is that of “the auditor” with the responsibility to make sure that the results are accurate.

During the distribution of roles to participants, the trainer has to clarify what the single role is and has to explain, in practice, some appropriate questions or comments:

Leader (says, for example):

Each one of you explain or summarize the text of the problem. We can use a concept map or resort to a scheme to clarify the problem or part of it? We list the symptoms that can make us think of an infectious disease, can we speculate? Let’s focus on the problem. The possible mode of infection. What are the protective equipment that we could use? How can we protect ourselves and / or protect other patients from possible infection? Does anyone think differently? How can you defend your position?

Skeptic (says, for example):

Why are we doing this step? How can the response to this step lead to an acceptable solution to the problem? Before doing this step, we must consider this point. We need to know all other variables. Do the answers for this particular phase make sense? Why someone doesn’t agree with us? What assumptions have been made in solving this problem.

Controller (says, for example):

What other sources of information could help us? Before writing this stage, do we all agree on what was discussed? We have to prove the validity of this assumption or decision.

Monitoring the behaviour of participants and assist the task, assessment of learning and evaluation of working groups

The processes of monitoring and reviewing the activities take place in two different times and in different ways, according to the cooperative learning model.

After completing the training the various groups will make a presentation of the work by power point presentation or transparencies. The scientific, accurate results can be evaluated in the classroom, through discussions

with colleagues. The authentic evaluation can only be carried out in the field and will be positive only if this results in positive changes in behavior.

The proposal for an “alternative assessment” instead of a traditional assessment has been proposed by Grant Wiggins [20] and indicates an assessment that will test not only what a student knows but also what he “knows how to do with this knowledge. “The intent of “authentic assessment” is to engage students in tasks that require the application of knowledge in real-world experiences [21]. Regarding the monitoring of processes and social skills we have prepared a special form of observation, while a further form has been distributed and completed by learners who have self-evaluated their interaction processes.

Evaluation criteria and results

The objectives of training and learning were assessed by a text (specifically designed) administered before and at the end of the training. The subject areas assessed were the following (according with Gilbert’s evaluation criteria):

- knowledge and cognitive processes (progress test);
- problem solving skills (presentation of problematic cases);
- gestural skills (construction procedures).

The cooperative goals were assessed through all phases of processing and monitoring of training (Tab. III).

The results in both training areas have shown an increase from baseline, distributed as following: the knowledge area was increased on average by about 30% of all groups formed, the problem solving skills were changed on average by 37% and we find also an increase of 38% of gestural skills.

In particular:

- *Knowledge and cognitive processes:* the results showed a particular increase from the ability to recognize symptoms of diseases transmitted through droplets. This result seems particularly interesting in relation to the fact that during the initial recognition, the staff said they did not consistently using protection systems.
- *Problem solving skills:* the construction of care procedures has been the main factor of increase of correct answers. This result is very important for us because, before this training period, there weren’t

Tab. III. Tools and skills assessment. Results expressed as a percentage increase from baseline of total subjects formats.

| Instruments Objectives | Clinical problematical case | Progress test pre/post test | Group performance | Procedures |
|-----------------------------------|-----------------------------|-----------------------------|-------------------|------------|
| Knowledge and cognitive processes | | 30% | | |
| Problem solving skills | 15% | | | 22% |
| Gestural Skills | 10% | | | 28% |
| Relational skills | | | | |
| Cooperative Learning Objectives | 12% | | 35% | |

any procedures in the units involved. In addition, we also obtained an interesting increase in the ability to choose the correct methods in the clinical management of complex cases.

- *Gestural skills*: the construction of care procedures has been, in this area, a very important factor of increase of correct answers, as required the detailed description of the action sequences to follow.
- *Cooperative learning objectives*: the contents of this area have achieved the best results in terms of increase from baseline. Participants improved their communication skills in general and teamwork. The other achievements are: sharing common goals, mutual monitoring behavior and their colleagues, even those designed to protect the security standard.

The results of the project here described indicate, in all the participants of groups an improvement of their skills and knowledge about the correct behavioural procedures to limit biological hazards for themselves and for their patients. We also observed increased motivation and awareness, and a greater ability to take action when they see the adoption of inadequate or incorrect procedures by other people or colleagues.

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Conclusion

Current trends in the field of primary education and higher education focus on the need to move from a teaching model to a learning model. We believe that this is a productive model in "long life learning" in the same way. Several factors are necessary for this change: for this to happen successfully, trainers must change their role from that of disseminating knowledge to that of a facilitator.

During training we need to integrate learning with strategies not only to acquire knowledge but to develop skills by problem solving through real problems applying the approach demonstrated throughout the course of the lessons [22].

The traditional classroom setting encourages personnel to be passive and this may reduce their motivation to learn new information and may alter their ability of correct judgment. Cooperative learning is the strategy that we think can be used to engage personnel of all ages in active learning through the implementation of prevention, reasoning, problem solving skills and teamwork.

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