

INCIDENCE OF BIOLOGICAL FLUID-RELATED ACCIDENTS AMONG INTERNS OF A UNIVERSITY-HOSPITAL

STUDIO DI INCIDENZA SUGLI INFORTUNI A RISCHIO BIOLOGICO NEL PERSONALE MEDICO IN FORMAZIONE SPECIALISTICA IN UNA AZIENDA OSPEDALIERO-UNIVERSITARIA

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Key words: Biological risk, occupational injuries, health care workers

 **Parole chiave:** Esposizione a materiale biologico, infortuni occupazionali, operatori sanitari

Abstract

Background: The Hospital meant as work environment differs from most of the work environments for the plurality of executed activities. One of the primary risks is the biological one for parenteral transmission diseases connected to occupational injuries during health-care activity. The exposure to biological risk is very common in health workers, and hepatitis B and C and acquired immunodeficiency syndrome are the most frequent infectious diseases.

Objectives: To identify, over a period of nine years (2002-2010), the prevalence and the main causes of occupational biological exposure accidents, and the possible prevention tools, in the interns of the University Hospital of Ferrara.

Methods: We used a retrospective cohort study including a mean annual number of 537 interns (32 ± 4 years). Data on biological incidents were collected during a surveillance programme of occupational exposure to blood and fluids.

Results: There were 331 incidents which occurred in the all period with an increase from 31 in 2002 to 41 in 2010. Needles were the medical device most frequently involved in percutaneous injuries (82.8%), and 84.3% were blood contacts. An interview to a subgroup of interns who had a biological incident showed important errors in their use of personal protective equipment. Although some contacts were with infected blood, no seroconversion has been registered. In the analysed subgroup of 20 sample subject, only 4 out of 20 doctors during specialty professional training declared to have participated to formation courses and only 13 out of 20 were wearing the individual protection disposals (I.P.D.) when the accident occurred. The principal reason reported by the people concerned about the lack of usage of I.P.D. was they had underestimated the dangerousness of the maneuver they had to carry out .

Discussion and Conclusions: The study underlines the importance of HBV vaccinations and access to HIV post-exposure prophylaxis. The interns are at high risk of contact with biological fluids. Prevention requires a global strategy including the availability and the proper use of protective and safety devices, the application of the universal rules of prevention, and training programs. More effort in preventive strategies is necessary to decrease biological accidents in young physicians. Therefore an appropriate prevention can be reached taking into consideration all the organizational and educational measures to reduce the accidental events concerning the health-care workers; among these measures the organization of specific educational courses, the availability of the adequate disposals and the test of their efficacy and liking of the users.

Other useful measures for the prevention can be adopted at the moment of medical periodic preventive examination consisting of publicity campaign of all the accidental events and the delivery of informative.

Abstract

Introduzione: L'Ospedale inteso come ambiente lavorativo si differenzia dalla maggior parte degli ambienti di lavoro per la molteplicità delle attività svolte, che espongono gli operatori a diversi rischi di cui il principale è il rischio biologico da malattie a trasmissione parenterale, in particolare l'epatite B e C e l'infezione da HIV, legato ad un evento infortunistico.

Metodi: Sono stati rilevati gli infortuni biologici denunciati da una media annua di 537 medici in formazione specialistica dell'Azienda Ospedaliero-Universitaria di Ferrara (età media \pm deviazione standard: 32 anni \pm 4; 66% femmine e 34% maschi), tramite uno studio di incidenza durato 9 anni in un intervallo di tempo compreso tra il 1 gennaio 2002 ed il 31 dicembre 2010.

Risultati: Nel periodo preso in considerazione sono stati rilevati 331 infortuni biologici (media 36,8 infortuni per anno) con un trend in aumento negli ultimi anni: 41 infortuni nel 2010 su 438 medici in formazione specialistica (9,36%), rispetto ai 31 infortuni segnalati nel 2002 su 560 medici in formazione specialistica (5,53%). Per quanto riguarda il tipo di esposizione nell'82,8% dei casi è stata cutanea ed il materiale biologico coinvolto era sangue nell'84,3% dei casi. Gli agenti lesivi causa di infortunio in più della metà dei casi consistevano in ago cavo o da sutura; punture e tagli rappresentano il 72,4% dei casi e la modalità di infortunio più frequente (41,5%) è quella che si verifica in sala operatoria durante gli interventi chirurgici. Infine su 331 infortuni 6 pazienti fonte erano HBV positivi (1,8%), 33 HCV positivi (10%) e 2 HIV positivi (0,6%). Un'indagine su un campione di soggetti infortunati ha evidenziato importanti

lacune sull'uso dei dispositivi di protezione individuale (D.P.I.), l'80% non aveva ricevuto informazione/formazione adeguata sull'utilizzo dei D.P.I.

Discussione e Conclusioni: Grazie all'alta adesione alla vaccinazione antiepatite B (oltre il 95% del personale) e alla corretta applicazione del protocollo post-esposizione per HIV, nel periodo indagato non ci sono state siero-conversioni da parte degli operatori sanitari infortunati. L'alta percentuale di infortuni nei medici in formazione specialistica è probabilmente dovuta alla minore esperienza lavorativa e alla mancanza di adeguati corsi di formazione sull'uso corretto dei D.P.I.. Le cause più frequenti di mancato utilizzo di D.P.I. erano la sottovalutazione della pericolosità della manovra da effettuare e la scomodità dell'utilizzo. Devono pertanto essere messe in atto una serie di misure organizzative ed educative per ridurre gli eventi infortunistici degli operatori, organizzando corsi di formazione specifici, mettendo a disposizione i DPI adeguati e verificando con appositi protocolli interni il loro uso corretto, la loro efficacia e gradimento da parte degli utilizzatori. Altre misure utili per la prevenzione possono essere attuate al momento della visita medica preventiva e/o periodica consistenti nella sensibilizzazione relativa alla segnalazione di tutti gli eventi infortunistici e nella distribuzione di materiale informativo.

Background

The Hospital meant as work environment differs from most of the work environments for the plurality of executed activities. One of the primary risks is the biological one for parenteral transmission diseases connected to occupational injuries during health-care activity.

The most frequently involved diseases are Hepatitis B (and consequently Hepatitis D), Hepatitis C and the infection from HIV (Human Immunodeficiency Virus) (1, 2, 3, 4).

Among the principal parameters of the administration of quality the Health Care Companies have to take safety into great consideration in order to foresee and recognize professional risks for health care workers. A qualifying aspect of the safety education of health workers is that it is considered as a fundamental moment in the professional-educational training, through the real awareness of the risks connected to the future professional activity. Adequate behaviours facing the risk hardly become part of the procedure whether they were not acquired during the first phase of the professional training (5, 6).

The aim of our study was to identify the principal causes of biological injury, and the prevention among the specialty professional training of doctors who are more and more involved in the above mentioned injury typology. Afterwards, on a sample of injured workers, we investigated the modality of usage of individual protection disposals (I.P.D.), with a view to a future plan to prevent the reduction of biological incidents.

Methods

Through a study of the incidence lasted 9 years (1st January 2002 - 31st December 2010), we recorded the biological accidents denounced by an annual mean of 537 doctors during the specialty professional training (average age: 32.6 years, \pm 4.34; 66% female and 34% male). Data were collected through a special report filled out in the presence of the injured health care worker. In addition to the personal data the following were registered: date, time, place of the accident, a brief description of the event, the vaccinal status and the usage of I.P.D.

Afterwards we investigated the biological accidents happened during 2009, given that the highest number of incidents happened during this year, on a sample of 20 doctors injured during their specialty professional training inside the Azienda Ospedaliero-Universitaria of Ferrara. For this purpose we handed out a multiple choice questionnaire, based on questions whose aim was to investigate the modality of usage of individual protection disposals (I.P.D), when the accident occurred; this questionnaire was meant to collect the personal data, the department, the specific duty, the detailed description of the event and the vaccinal coverage. Then for any of these variables we calculated the absolute and percentage frequencies.

Finally we investigated in detail the following parameters in the above-mentioned sample: whether the formation/information about the usage of I.P.D. took place, possibility to find them easily in the different departments and possible explanation in case they were not used.

The protocol about the biological risk in force in the Azienda Ospedaliero-Universitaria gives the exposed health care workers an appropriate procedure about the handling of the biological accidents and the post exposition prophylaxis (PEP) which contemplates a serological test in 0, 1, 3 and 6 months since the accident.

Results

Since January 2002 to 31st December 2010 there were 331 biological accidents (average 36,8 accidents per year) with an increasing trend in the last two years, respectively 44 accidents in 2009 (8.94%) and 41 in 2010 (9.36%) in comparison with the 31 ones reported in 2002 and 2003 (respectively 5.53% and 5.52%). The data refer to the total amount of doctors during the specialty professional training attending the different Schools of Specialization including those where the risk of biological accident is quite low. (Figures 1 and 2).

Fig. 1 - Number of biological accidents from 2002 to 2010 in interns at the University-Hospital of Ferrara

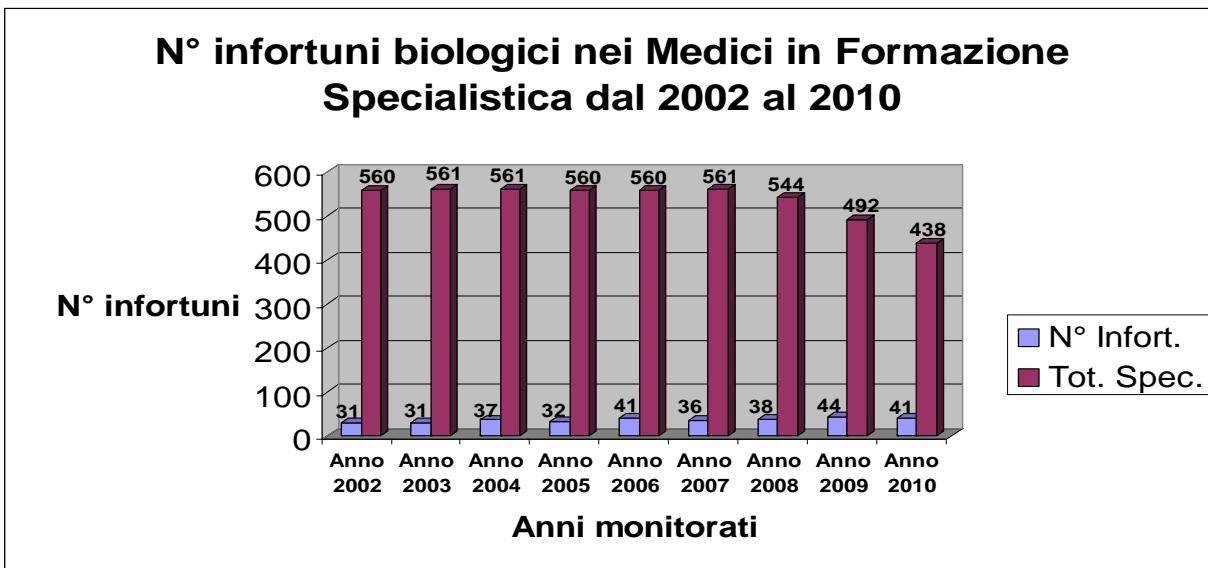
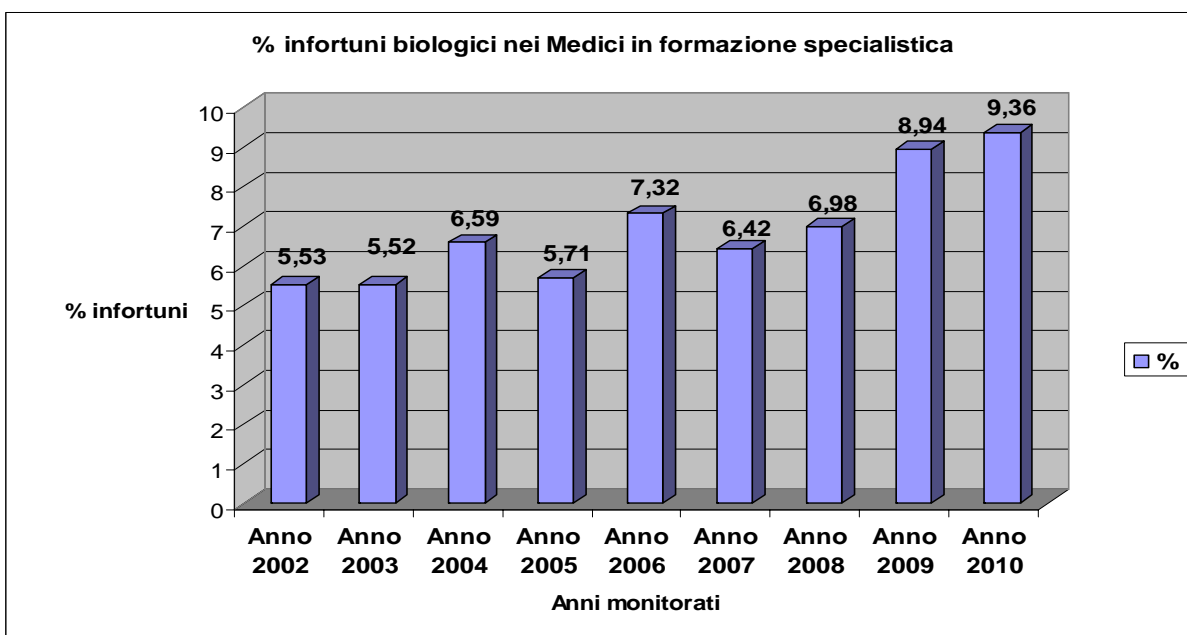


Fig. 2 - Percentage of biological accidents from 2002 to 2010 in interns at the University-Hospital of Ferrara



Considering the everyday practice the effective number of exposed staff is lower and mostly concentrated among the medical and surgical disciplines.

As to the type of exposure in 82.8% of cases it was cutaneous and blood was the biological involved material in 84.3% of cases (Table 1). The harmful agents which caused the accidents in more than half of cases consisted of hollow or suture needle (Table 2).

In reference to the distribution of accidents according to the tipology, it is evident that needle pricks and cuts represent the 72.4% of cases, while squirt or contamination are responsible for less than a quarter of the accidents (Table 3). Moreover the 41.5% of the accidental events happens during the surgical interventions and, unfortunately, 0.6% of health care workers' accidents happen while recapping needles (Table 4). Finally, as quoted in Table 5, out of 331 accidents, 6 source patients were HBV positive (1.8%), 33 HCV positive (10%) and 2 HIV positive (0.6%). The 4.5% of accidents happened by an unknown source. During all the years taken into consideration there were not serum conversions by the involved health care workers, thanks to the high adhesion to anti-hepatitis B vaccination (more than 95% of the staff) and to the right application of the post-exposure protocol for HIV.

In the analysed subgroup of 20 sample subject, only 4 out of 20 doctors during specialty professional training declared to have participated to formation courses and only 13 out of 20 were wearing the I.P.D. when the accident occurred. The principal reason reported by the people concerned about the lack of usage of I.P.D. was they had underestimated the dangerousness of the maneuver they had to carry out (Table 6).

Table 1 - Accidents distribution by type of biological exposure and material

ESPOSIZIONE	N°	%
Cute	274	82,8
Mucosa	49	14,8
Cute e Mucosa	8	2,4
Totale	331	100%
MATERIALE BIOLOGICO	N°	%
Sangue	279	84,3
Sangue misto ad altro materiale	50	15,1
Saliva	1	0,3
Urina	1	0,3
Totale	331	100%

Table2 - *Devices involved in the accidents*

AGENTE LESIVO	N°	%
Ago siringa	38	11,5
Ago chirurgico (da sutura)	120	36,2
Ago cannula/Abocath/CVC	17	5,1
Altro ago/tagliente	75	22,6
Bisturi	27	8,1
Elettrobisturi	3	0,9
Ferro chirurgico	6	1,8
Guanto rotto	4	1,2
<i>Altro</i>	<i>41</i>	<i>12,4%</i>

Table 3 - *Accidents distribution by type*

LESIONE	N°	%
Puntura	215	64,9
Schizzo	57	17,2
Imbrattamento	25	7,6
Taglio	25	7,6
Graffio	3	0,9
Escoriazione	4	1,2
Ustione	2	0,6
<i>Totale</i>	<i>331</i>	<i>100%</i>

Table 4 - Work situations at risk of biological accidents

Modalità	N°	%
Durante intervento chirurgico	137	41,5
Lavando elettrobisturi	27	8,1
Suturando ferita	17	5,1
Causa altro operatore	8	2,4
Posizionando CVC	7	2,1
Ago in luogo non appropriato	4	1,2
Ago sporgeva dal contenitore	3	0,9
Dopo prelievo ematico	6	1,8
In corso di autopsia	5	1,5
Reincappucciando l'ago	2	0,6
Altro	115	34,8
Totale	331	100%

Table 5 - Serologic data of the source patient (when identified)

PAZIENTE FONTE	N°	%
Consenziente	316	95,5
Non consenziente	-	-
Sconosciuto	15	4,5
Totale	331	100%
SIEROLOGIA PAZIENTE	N°	%
HBV-HCV-HIV negativo	275	83,1
HBV positivo	6	1,8
HCV positivo	33	10,0
HIV positivo	2	0,6
Sconosciuto	15	4,5
Totale	331	100%

Table 6 - Interview results of the intern subgroup on the proper use of personal protective equipment

Quesiti	M.F.S. num. (n=20)	M.F.S. %
Informazioni sul corretto uso D.P.I.		
SI	4	20
NO	16	80
Formazione uso D.P.I.		
SI	4	20
NO	16	80
	M.F.S. num. (n=20)	M.F.S% (su 7 che non avevano utilizzato DPI).
Mancato uso D.P.I.		
Sottovaluta manovra	4	57,1
Scomodità utilizzo	3	42,9
Non disponibili	0	0
Manovra non prevista	0	0

Discussion and Conclusions

Despite the decrease of the absolute number of doctors during specialty professional training, who attended the Schools of Specialization of the University of Ferrara, due to the different regulations issued in various years, the percentage of accidents has increased twice as much from 5.53% of 2002 to 9.36% of 2010. Probably this has to be correlated to the fact that, since the very beginning of the course, according to the recent regulations of the Schools of Specialization post-graduate Medicine doctors are involved in practical activities with direct responsibility.

The most frequent typology of incident is the percutaneous exposure caused mainly by the prick of hollow or suture needle. Blood is the biological material with which the health care workers often come into contact, given that as a consequence of most of the tasks connected with the health care these situations of risk are among the most common both in the surgical and medical departments (4, 7, 8, 9).

The verification that we did of a high number of biological injuries in doctors during specialty professional training confirm the previous reports by Saia M et al. (9) of a higher annual index of incidents concerning this group of doctors in comparison with the specialist doctors. The brief work experience of the staff in training and the peculiarity of the work typology linked to the different hospital departments can play a prominent role as a cause of incident, as proved by several authors (5, 6, 7, 8, 10, 11, 12). Moreover Sacchi M et al.(12) demonstrate that the accidental phenomenon is linked to the old age of the injured health care workers, in fact the highest number of contacts take place in the group composed by the obstetric staff with length of service of less than five years.

Taking into consideration that: 1) cuts and pricks represent the most frequent event of accident; 2) the suture activity inside the operating theatre has the major risk, the reported data of the present study are in line with what has reported by literature on this topic. The Gruppo di Studio Italiano sul Rischio Occupazionale da HIV (Italian Group of Study about the Occupational Risk by HIV) fully demonstrated that percutaneous exposure incidents represent the most frequent method of biological injury and that syringes and suture needles are the most frequently involved (4, 7, 9, 10, 13).

As it is possible to see in Table 5, despite there were 6 injuries with an HBV-positive patient, 33 with an HCV-positive one and 2 with an HIV-seropositive patient, there were no case of seroconversion of the health care workers. Therefore it is necessary to incentivize the personnel about the application of the prevention standards present in D.M. 28/9/1990 (14) given that the respect of universal precautions and the post-exposure prophylaxis contribute to decrease of more

than 1/3 the consequences of biological-risk incidents, in case it is not possible a primary prevention through vaccination (9, 15, 16, 17).

An aspect emerged from the sample investigation in the subgroup of the doctors in specialty professional training (Table 6) interviewed about the right usage of I.P.D.: the non-optimal adhesion to the indications established by the current regulations; in particular the 80% of doctors in specialty professional-educational training declared they were not given the appropriate information and an adequate education about the right use of I.P.D. Approximately a third were not wearing an appropriate I.P.D. when the accident occurred and the 57.1% declared they they had underestimated the dangerousness of the maneuver they had to carry out, while the 42.9% considered uncomfortable the use of I.P.D. In particular lateral protection safety spectacles were subject to mist and face masks slipped out of their position causing a frequent and uncomfortable repositioning of the devices. The non-elevated adhesion to the I.P.D. usage is emphasized also by the other authors who report a percentage of 45% of non-usage of I.P.D. among the injured of their case study (12).

In our Azienda Ospedaliero-Universitaria, to provide for this situation, a procedure about the right handling of the individual protection disposals was prepared and inserted in the intranet site; a tutor is the responsible of delivering and give the worker the specific training of about the protection disposals. Moreover, through an apposite form, the health-care worker can send remarks about the quality and the ergonomic features of I.P.D. The discomfort when using the I.P.D. represented the 42.9% of reasons why the disposals were not used in our sample. Finally in the hospital corporate intranet site the forms the related procedure to communicate an biological incident are available; the aim is to have a more comfortable and fast denunciation of the event. We hope this could contribute to the reduction of the under-reporting phenomenon widely related in literature (6, 10, 18). We could test the efficacy of these interventions in two years through an exam of the results.

Therefore an appropriate prevention can be reached taking into consideration all the organizational and educational measures to reduce the accidental events concerning the health-care workers; among these measures the organization of specific educational courses, the availability of the adequate disposals and the test of their efficacy and liking of the users.

Other useful measures for the prevention can be adopted at the moment of medical periodic preventive examination consisting of publicity campaign of all the accidental events and the delivery of informative.

NO POTENTIAL CONFLICT OF INTEREST RELEVANT TO THIS ARTICLE WAS REPORTED

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