

NEEDLESTICK – HOW TO PREVENT NEEDLESTICK INJURIES EFFECTIVELY

1. Organisations involved

State Health Office Baden-Wurttemberg (Landesgesundheitsamt) and the University Hospital of Heidelberg (Universitätsklinikum) in cooperation with Statutory Accident Insurance for the Health Care Sector (BGW) and Statutory Accident Insurance for the Public Services Baden-Wurttemberg (UKBW) as well as with the Freiburg research centre for occupational and social medicine (FFAS).

2. Description of the case

2.1. Introduction

In Germany some 750 000 people work in hospitals and other patient treatment facilities. Studies showed that the number of needlestick injuries (NSI) per worker per year can be as high as 0.41 (Hasselhorn et al., 1995) or even 0.98 (Beie, 2000). It has been estimated that there are up to 500 000 NSI per year in Germany, less than 50 % of which will be registered (Beie, 2000; Berger et al., 2000). For the workers the consequences of a single needlestick injury can be severe or even fatal: the risk comes from blood that remains on the needle and can lead to infections. The most common risks are Hepatitis B and C and HIV infections. In 2004 the German Statutory Accident Insurance associations BUK and HVBG (now merged into DGUV — Deutsche Gesetzliche Unfallversicherung) recognised 218 cases of hepatitis infections and eight cases of HIV as occupational diseases (Muller-Barthelmeh et al., 2007).

Figure 1. Injuries from needles can be serious and even lethal



Considering these statistics, excellent occupational medical care of workers including preventive check-ups, vaccinations, etc., should be standard, as well as the registration of each NSI as an accident at work. During vocational training the staff should be shown safe working practices (no recapping) and special containers should be provided for used needles.

Nonetheless the crucial problem that needs to be solved remains: how can needlestick injuries be prevented as efficiently as possible? The university hospital of Heidelberg and the State Health Office of Baden-Wurttemberg wanted to give answers to the crucial question by carrying out a two-year on-the-job intervention study into the effectiveness of safety needles and other preventive measures.

2.2. Aims

The aims of this study were to quantify the effectiveness of different prevention strategies, such as the use of safety instruments in comparison with conventional instruments, and the effectiveness of special sensitisation training for staff concerning NSI.

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The intention was also to investigate the usability of safety instruments in comparison with conventional needles and syringes, and to verify the accuracy of the registration rate of accidents at work at the university hospital.

The overall goal of the public health department was to determine whether official Recommendations for the use of certain instruments, or for the promotion of certain work techniques, could be given.

2.3. What was done, and how?

At the beginning of the study, 18 departments of surgery, gynaecology, internal medicine, and skin diseases of the hospital were chosen to participate in the study. Three groups were formed by volunteers, comparable in terms of number of workers, number of patients and job description/tasks (intensive care, general care, and ambulant care):

- Group 1 (160 workers) carried on working with conventional needles and syringes and were not given any additional training;
- Group 2 (143 workers) were given special advice before the study in order to sensitise them with regard to NSI and working techniques;
- Group 3 (138 workers) were also given special advice before the study and, additionally, the workers were required to work only with safety instruments for 12 months whenever possible.

All safety instruments used by Group 3 in the study had to fulfil the NIOSH safety criteria (NIOSH, 1999). The instruments provided could be used for taking blood samples/blood withdrawal from capillaries, veins and arteries, for injections (subcutaneous and intramuscular), and for intravenous catheters. Safety containers were provided for the disposal of used instruments.

After the participants had been recruited they all had to fill in a questionnaire entitled 'a single prick infects' (in the following quoted as Q1) about accidents and prevention measures during the previous 12 months. Questions included: how many NSIs occurred? Was the accident registered? How did it happen? Has any vaccination against hepatitis taken place? Did the worker use personal protective equipment (e.g. safety gloves when handling infectious material)?

The workers in Groups 2 and 3 were given special advice regarding NSIs. Group 3 was also trained in working with the new safety instruments and in the safe disposal of needles and syringes.

Over the next 12 months the safety containers of Group 3 were checked periodically to determine whether the safety instruments were being used and disposed of correctly. The workers in Group 3 also had to evaluate the usability of the safety instruments after six months and at the end of the study. After 12 months all participants were asked to fill in the original questionnaire again (in the following quoted as Q2) in order to compare data from before and during the study.

On the basis of the data from both questionnaires, the usability evaluation and the monitoring during the study, FFAS Freiburg (Freiburg Research Centre for Occupational and Social Medicine) carried out the final evaluation. The study data were also compared with long-term accident data contained on the university's database.

2.4. What was achieved?

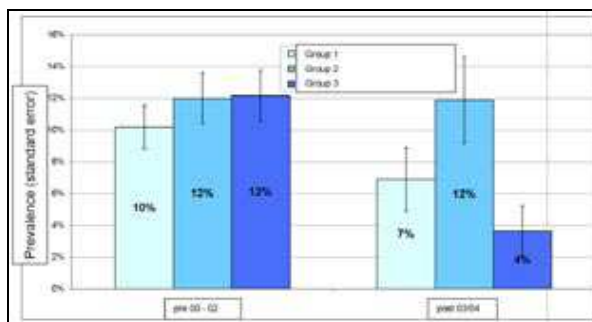
Results of the questionnaires 'a single prick infects'

In all, 194 workers filled in both questionnaires. They were chosen for the final evaluation as only their given data were considered to be comparable.

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- In all three groups there was a drop in NSIs from 12 % to 8 % at the end of the study. In Group 1 the statistical average dropped from 11 % to 8 %, in Group 2 from 16 % to 11 % and in Group 3 from 7 % to 4 %.
- The most dangerous tasks identified in questionnaire 1 (Q1) were disposal of instruments, drawing up the injection, recapping, and sewing. In questionnaire 2 (Q2) the most dangerous task mentioned was drawing up the injection.
- The most dangerous instruments were cannulas, syringes and catheters. Fewer accidents happened when using surgical instruments (e.g. blades).
- Most accidents happened in patients' rooms.
- In Q1 50 % of accidents were declared to have been registered, in Q2 62 %. Most workers consulted the occupational physician, or the hospital emergency unit.
- In Q1 55 % of the workers were wearing safety gloves when the accident occurred,
- in Q2 52 %. Concerning gloves, 86 % said they wore safety gloves when handling infectious material.
- In Q2 91 % of the workers said they had been vaccinated, 7 % were not sure about their status, and 2 % said they had not been vaccinated.

Table 1. Prevalence (needlestick injuries) in the three groups of the study pre- and post-intervention



Study data in comparison with long-term data from university's database

Since 1990 all NSIs at the university hospital have had to be registered. Since 1997 the registration has been standardised and mainstreamed in a central database. Data can be searched by hospital department and according to different tasks.

Between 1997 and 2002 a total of 291 NSIs, which equals an annual average of 48.5, were registered for the departments which took part in the study. The annual minimum of registered NSIs was 42 while the maximum was 51. The long-term average risk/NSI prevalence (registered cases only) per worker was 10.77 %¹.

If the group-specific annual long-term NSI prevalence for the years 2000–02² is compared to the study data, the following findings can be stated:

- In Group 1, the annual long-term NSI prevalence was between 12 % and 7.2 %. During the study the accident rate among the workers was about 6.9 %.

¹ In these data multiple accidents — more than one worker involved in a single accident — were not included so that the real number has to be estimated to be slightly higher. It can be seen that the general prevalence rates are lower than in the cited reports (Hasselhorn 1995; Beie 2000); the project team thought one possible explanation might be that the care personnel in the university hospital were generally well trained.

² The years 2000–02 were chosen because of the comparability of the workers who also participated in the study. Data from these years were defined to be pre-intervention findings.

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- In Group 2, the annual long-term NSI prevalence was between 13.7 % and 10.8 %. During the study the accident rate was 11.9 %.
- In Group 3, the annual long-term NSI prevalence was between 13.1 % and 10.9 %. During the study it dropped to 3.6 %, which equalled five registered cases within 12 months.
- It should be noted that all five accidents to workers in Group 3 happened when they were using conventional instruments.

Monitoring of the study/checking disposal containers

Before the study and during the advice and training phase, 273 instruments disposed of by Group 3 were checked and 22 % were found to have been recapped. During the study 4 586 instruments disposed of by Group 3 were examined: 89 % were safety instruments with correctly activated safety mechanisms and in 5 % of cases the safety mechanism was not activated. Of the instruments disposed, 6 % were of conventional design. A minimal number of needles had been recapped.

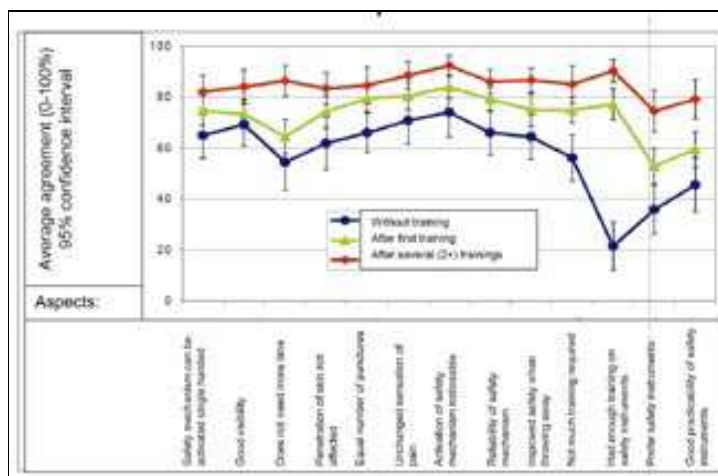
Usability aspects

Two additional polls among the workers in Group 3 yielded findings on the usability of the safety instruments. The first poll was done six months after the intervention study had commenced, and the second after 12 months. Eleven specific questions were about the usability of the safety needle, disposal issues and training on the new device, and two additional items were about the users' general impression of the safety instruments. Generally, acceptance of the new needles grew with the time in use and users' experience in handling them. After 12 months the response to all specific questions, as well as the workers' general impressions, were more positive than in the first poll.

Detailed findings were:

- workers who had been trained several times on the new devices were more positive than workers who had been trained only once;
- untrained workers were more likely than their trained colleagues to reject the safety instruments;
- workers accepted the new equipment more readily if they were aware of the personal advantages of reducing their risk of infection;
- the easier the safety mechanism was to activate (less training needed, one-handed rather than two-handed activation, as quick to use as possible) the greater was the acceptance of the new instrument and the general impression on the part of the user.

Table 2. Usability of new safety equipment



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Evaluation of the results

The usability polls and the collected disposal samples show that, in general, the safety instruments were commonly used (94 %) by the workers and there was a growing acceptance of, and satisfaction with, the new equipment with better training and more on-the-job experience.

New safety equipment is less accepted by workers who have not been trained in its use. To enhance acceptance, re-training should be offered periodically. Furthermore the safety mechanism should be easy to activate and as quick to use as possible.

A comparison of the data from the questionnaires shows a drop in the number of NSIs before and during the study among all three groups. This can probably be attributed to short-term sensitising effects among all workers. The comparison of intervention study data with long-term data reveals that the NSI prevalence of Groups 1 and 2 was comparable to or only very slightly better than long-term prevalence. The results of Group 2, which was given additional advice only, show in particular that sensitising alone is not sufficient to reduce the risk of NSI effectively.

In contrast to Groups 1 and 2, the findings among Group 3 show a statistically significant reduction of NSI below the long-term accident rates. It must be noted that all registered accidents to workers of Group 3 happened when they were working with conventional instruments.

In other words, during the study not a single accident with a safety instrument was registered. This underlines the efficacy of safety needles and good disposal practice in the prevention of NSIs.

Problems faced

The project team did not face any major problems. The cooperation with the partner was excellent. With regard to the study design it was extremely helpful that the team could rely on long-term data from the University Hospital of Heidelberg. In more general terms, it can be observed that hospitals and other health-care facilities do not invest in safety instruments: the management is wary of the higher costs, although their effectiveness in accident prevention has been proven. But the idea that safety instruments don't make financial sense simply isn't true: researchers at the University of Wuppertal have estimated that safety equipment causes additional costs of EUR 63 per worker a year while each needlestick accident costs around EUR 480 (Wittmann & Zylka-Menhorn, 2007).

2.5. Success factors

The most effective way to reduce the NSI prevalence among health-care workers is to use several prevention methods at once. Technical improvement should go hand in hand with enhancing workers' knowledge and skills. That means:

- sensitising workers to the specific risk of working with sharp and infectious equipment;
- introducing safety equipment which is easy to use with safety mechanisms that are easy to activate;
- providing safety disposal containers to help eliminate danger from discarded needles;
- offering vocational training on the new equipment and periodically refreshing workers' knowledge.

Safety measures should be monitored by registering accidents in a central database. This will also mean that the workers know what to do and who to contact in the event of an accident. In this way the sustainability of accident prevention measures can be ensured and, in the case of an increase in accidents, new measures can be taken.

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2.6. Further information

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2.7. Transferability

As a result of the project the State Health Office of Baden-Württemberg officially recommends the use of, and training of workers on, the safety equipment which was used in the study and which is approved for medical use in Germany.

The study itself was observed with great interest in the health-care sector and stimulated further hospitals to evaluate safety and accident registration in regard to NSIs at their facilities. The State Health Office of Baden-Württemberg carried out a follow-up project in 2008 in collaboration with the University Hospital of Heidelberg to verify the data. Results will be published soon.

The German TRBA 250 (Technical Rule on Biological Substances in the Health Care Sector, 2003, last modified 2008) declares the use of safety disposal containers for sharp instruments and needles to be obligatory. Furthermore, the use of safety instruments has become obligatory for workers (except for the self-employed) in emergency medical services, prison hospitals, in facilities where highly infectious patients are treated, and for tasks that pose the risk of contact with body fluids in sufficient quantity to cause infections (for more information see LADR, 2008; BAuA, 2008; Wittmann & Zylka-Menhorn, 2007).

3. References, resources:

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The logo for 'CASE STUDIES' features a stylized white figure on the left, resembling a person or a medical symbol, set against a blue background with a white, wavy, paper-like texture. To the right of the figure, the words 'CASE STUDIES' are written in a large, white, sans-serif font.

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