Decontamination Exercise at a General Hospital

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Abstract

By using a luminescent material as a substitute for radioactive contamination a realistic assessment of the emergency plans for dealing with contaminated radiation casualties at a Regional General Hospital was made. The areas where problems arose in these plans are described and the changes now made to them given.

Introduction

Many hospitals have contingency plans to receive contaminated radiation casualties as part of the national arrangements for dealing with such events. Fortunately very few have to ever implement these plans and a real experience of how they would work is not available. Aberdeen Royal Infirmary is a receiving hospital for the North East of Scotland. Although we have no nuclear reactor or naval bases in our area we do have several research institutions and the University, all of which use quite large quantities of unsealed sources. A large air force base with strike aircraft based at it is also present. In addition to these long standing users we have had, in recent years, spent radioactive fuel occassionally passing through the area on its way to Dounreay for processing. The biggest recent influx of radioactive sources however is those introduced by various service companies to the oil industry. These are mainly large sealed sources but also include some unsealed sources.Our plans to deal with such casualties were written and prepared on very similar lines to those prepared for use in other hospitals and we had every confidence they would deal with the situation if it ever arose. As part of an on going evaluation of all emergency plans it was decided to test the plans in what would be perhaps the worst scenario.

Scenario

An accident was assumed to have taken place at one of the oil related companies resulting in the rupture of a sealed source. Casualties were restricted to two so that a realistic assessment of the plans could be made within a reasonable period of time. The clinical injuries were kept to a minimum as our decontamination procedures were being tested not the medical treatment. Sufficient clinical work had to be provided however to provide a realistic situation. One casualty was made up so as to indicate a broken tibia and facial lacerations from flying debris, the other broken ribs with a pneumothorax. Radiation contamination was simulated using a fluorescent powder. This had the very real advantage that in small quantities it was invisible to the eye but could be seen when viewed under a U.V. light. By using hand held

U.V. lights it was possible to simulate the contamination monitoring equipment that would be available. [Anthracene was used for this exercise, as this was commonly used in other areas for similar work. Tests were made to ensure that the two casualty volunteers were not sensitive to it by contaminating a small area of forearm skin a few days before the exercise. Recent recommendations on the use of anthracene for this purpose would suggest that an alternative powder should be considered]. The contamination of the casualties was restricted to quite a small area and was not visible to the naked eye. Likewise the floor around the casualties was contaminated but this again was not visible to the naked eye.

Senior management staff in all areas were aware of the exercise, mainly to stop events escalating rather than to ensure the exercise did not come to a complete stop. Most of the participants from telephone operators through to the emergency staff either did not know or were only vaguely aware that some sort of exercise was planned.

Description of Exercise

The hospital switch board was notified of the incident at 1.30p.m. and had successfully alerted all the emergency staff who had gathered with their equipment in the Accident and Emergency (A & E)departmentbefore the ambulance arrived with its casualties. If the incident had been out of normal working hours the physicists called in would have inevitably taken some time longer to appear. The first part of our plan involved covering the floor of part of our A & E department with polythene together with a "corridor" to this area from the designated entrance. It was very quickly realized this would not be possible to do in the time available before the casualties could arrive and the attempt was abandoned. Even with sheets of polythene cut to size it takes a surprising amount of time to lay and stick them down so that it is safe to walk on. Barriers were erected round the area to demarcate it. The personnel going into this controlled area put on protective clothing and other staff were positioned to service them as required.

Response of the Ambulance Crew

The crew were warned that the casualties were contaminated and they were entering (for the exercise) a radiation controlled area. They put on rubber gloves which subsequently split. If expert staff were present they would of course normally have advised them on what prcautions to take.. In this exercise no detailed advice was volunteered but would have been given if asked for. Likewise additional equipment held in the area would also have been provided if requested. No attempt was made by the crew to request contamination monitoring and none was undertaken. The clothes of both members of the crew became contaminated as well as the skin on their hands and knees. At the time of the exercise they were also expected to wear peaked hats at all times (this requirement has since been totally rescinded). As their hats fell over their faces and they pushed them back up, their faces and hair also became contaminated. Special 'impervious' coveralls were not normally carried on the ambulance although they were available at the ambulance depot. The ambulance became badly contaminated after they had put the casualties into it as, although they wrapped the casualties, their shoes and hands carried quite a large quantity of powder with them. During the crew's initial examination of the casualties and their treatment the contamination was spread over a much wider area. Without involving someone on site with a contamination monitor this spread of contamination

is impossible to control. Even if a monitor was available it is suspected that control would still be difficult.

Response of Accident and Emergency Department

The opportunity was taken to try out different types of protective clothing to see which was the most efficient and which the most convenient. This clothing varied from a simple white waxed paper suit with a theatre mask to a full PVC protective suit with a battery powered breathing hood. All staff wore normal disposable rubber gloves. Our plan stipulated that the ambulance men should hand over the patients at the entrance to the A & E department. Despite being aware of this they followed their normal practice and entered the area thus immediately contaminating the floor. One physicist had to be diverted from dealing with the casualties to monitor them and advise them what to do.

In the course of treating the injuries the doctor and nurses, even with "monitors" and advice available, spread the contamination to areas of the patient not previously contaminated. Our plans had laid down that staff in the controlled area should be kept to a minimum. This policy was felt to contribute to this spread as people moved from patient to patient and perhaps forgot the location of contamination on each patient. The other marked tendency was to use as little localised decontamination using swabs as possible and rely on the shower in the area to clean the rest. [The fact that the casualties were postgraduate male students and the nurses of similar age was not felt to have contributed to this].

At the end of the exercise anthracene powder was found all over the floor of the area and on the walls. The shower was generally contaminated. All individuals had some anthracene on their wrists and all but the person wearing the hood had some on their face. If it had been a real event a large part of the A & E department could have been taken out of use for several days while it was decontaminated. The consultant staff felt that even with the very small chance that a real incident would occur such a situation should not be contemplated.

Conclusions

For very little effort our procedures were tested under realistic conditions which highlighted many unsuspected inadequacies. The major one was that an alternative area required to be identified to receive contaminated patients if a large part of the A & E department was not to be under threat of being contaminated. This has now been found. A small room has been created at the very periphery of the A & E department which can, if necessary, be completely isolated without affecting the work of the A & E allowing decontamination to take place in a controlled manner. Medical equipment will have to be taken there if required but this is a minor problem. The room is completely tiled with a shower in one corner and can cope with two casualties. If more than two appeared they would have to stay outside in an Ambulance unless a life threatening situation existed. By being very prudent with the brief for this room the cost was kept to an acceptable level, even within the UK Health Service, for a room it is hoped never to use.

It was also apparent that although the hood provided complete protection it made communication with other staff and the casualties very difficult. It is now considered that the white wax suits used in conjunction with a high quality nasal mouth mask (i.e. rated for asbestos work) would suffice. It is accepted that some facial contamination may occur if loose powders

are present. Goggles should also be available. Long sterile gloves are absolutely essential, normal sterile gloves are inadequate. The stock of wellingtons also required changing - most of them were too big for the nurses.

Measuring pulse rates was difficult and a large clock with a sweep second hand would have been useful. Gauze swabs were found far more useful than disposable wipes and it was found that the stock of polythene bags for putting waste items into was soon finished. The idea of keeping the number of people involved to a minimum contributed to the spread of contamination and in future each casualty will have a "team" of people who will solely work on him/her. This will also allow much more of the contamination to be removed by local swabbing rather than using the shower.

Recommendation

All emergency plans for dealing with contaminated casualties should be tested using a real contaminant which can be spread in much the same way as a radioactive contaminant. Only by monitoring the spread of this material can a real assessment be made of the efficiency of the plans. Plans which are apparently quite adequate under routine trials can prove to have deficiencies when tested in this way.