Physicians, which states that the Industrial Health Service should be closely associated with the National Health Service at all levels. The Dale Committee also recommended the co-ordination of Industrial and National Health Services. It seems logical that the successful preventive work of the Public Health Service in every area of the country should not stop at the factory gate when there is exactly similar work to be done inside the factory.

The Public Health Service, although younger than the Factory Department, has been so successful that the original reasons for its existence have largely ceased to exist. In purely technical matters politics have very little influence upon the work of the Medical Officer of Health. The up-bringing of the Medical Officer of Health and the Industrial Medical Officer is very similar. In the two fields industrial diseases and epidemics have been largely eliminated and in both fields attention is being turned to positive well-being. The attitude of the workman to his job is greatly influenced by his up-bringing and home environment. These are already well known to the Medical Officer of Health, who may have records of him even going back to before he was born. But what little use is made at present of even the worker's school medical records!

Public Health Departments have at present the following association with factories. They inspect all sanitary conveniences and supervise heating, lighting, ventilation, cleanliness, overcrowding and drainage of floors in 26,464 factories without mechanical power. Canteens, all food factories, all smoke, dust, fumes, etc., emanating from factories and (in Birmingham) noise and vibration from factories usually come within the purview of the Medical Officer of Health, who also deals frequently with infectious disease in factory workers. Also of some concern to the Medical Officer of Health is rehabilitation, the welfare of disabled persons, industrial zoning and factory planning, supervision of outworkers and deployment of mass miniature X-ray apparatus. The Medical Officer of Health can do the work of the appointed factory doctor if no specific appointment has been made. The Medical Officer of Health is in a strong position to carry out all preventive work, having under his control or readily available to him inspectorial, nursing and social workers, chemical, bacteriological, X-ray and other technical facilities.

The Organisation Envisaged.

If the responsibility of providing a comprehensive service for industry were placed upon Health Authorities, it would be reasonable to confine this to only the larger ones, i.e. County Boroughs and County Councils, though County Councils might well have the opportunity of delegating certain functions, including probably the purely sanitary duties, to their district councils, where they would be under the supervision of the district Medical Officer of Health. Many health authorities would appoint a very experienced factory doctor as the Senior Assistant Medical Officer of Health for Industrial Health and in this section would be whole and part-time doctors and non-medical factory inspectors. The arrangements would thus be similar to those in other sections of Public Health Departments, such for instance as that concerned with Maternity and Child Welfare. Through the normal organisation within the Health Department, the work of the Factory Section would be co-ordinated with that of all other aspects of Public Health.

Appointed Factory Doctors would be employed by Public Health Departments and many Factory Inspectors would be so too. A nucleus of factory inspectors would be transferred to the Ministry of Health and become available to Health Authorities in a consultative capacity. They might also themselves supervise certain unusual and particularly dangerous industries.

The Public Health Department, already well known to all, would undoubtedly be neutral as between employer and employee. Factory problems such as the disposal of dust and fumes could be tackled as a whole, as the factory inspector would no longer be satisfied with their removal from the factory, but would have the responsibility of their final disposal so as not to prejudice the neighbourhood.

If and when health centres are established it would be natural to site some of these so as to serve groups of factories where medical examinations could be carried out and from where their health services could be directed.

The basic machinery and outlook for a comprehensive industrial medical service are already established in Public Health Departments and it would be reasonable to add to this such facilities for industrial hygiene as are here envisaged.

The Organization of First Aid in Work Places*

By
NEIL G. MARR
From Kynoch Works, I.C.I. Ltd.

The functions of industrial medical services are two-fold—the treatment of emergencies, occupational or not, and preventive medicine.


Apart from emergencies, therefore, the aim is to achieve positive health, and the purpose of this paper is to show that there is a real place for organized first-aid in preventive medicine. Industrial medicine is often considered under three broad headings—the worker, the work, and
the environment—and first-aid services can be similarly considered. Regarding the worker, the type of first-aid organisation will obviously depend on whether the employees are predominantly male or female. Again, the arrangements must be set-up according to the type of work, shifts must be covered, especially night shifts, when very often there are no trained nursing staff on duty. It is, however, under the heading of environment that first-aid plays such an indispensable part in encouraging positive health.

It is customary to break down the environment into four sub-headings—physical, chemical, biological and psychological. In the physical environment the presence of trained first-aid personnel is essential, because of the ever-present risk of physical injury such as wounds, strains, burns and fractures. Here there is wide scope for first-aid on the floor of the shop. The environment of the chemical industry has also its physical dangers, though slight, but the risks of chemical injuries (burns, eye splashes, gassings and acute poisoning) demand the presence of trained first-aiders, certain equipment and antidotes.

The biological environment does not really concern us, but mention must be made of the value of wide-awake first-aiders in a factory with a risk of anthrax. The early treatment of wounds and abrasions is most important in such a trade and, again, the first-aid man will see that suspicious sores and pustules are referred to a doctor or to hospital (Forms 410 and 1893, H.M.S.O.—" Anthrax "). First-aid also has its place in the psychological field. In circumstances where there is danger, such as in foundries or explosives factories, experience shows that when a first-aider leaves there is an immediate request from employees, and from management, for a replacement. The presence of trained men in dangerous occupations creates an atmosphere of confidence amongst the workers.

Indeed, in some plants it is essential that each worker shall be his own first-aider.

With regard to the organisation of first aid to cover this wide field, the first essential is adequate training, and the rest depends on the hazards to be covered. Basically the training should follow one of the standard Manuals—e.g., St. John Ambulance Brigade, British Red Cross Society, and the St. Andrews Association. I need not elaborate on these courses, but training of first-aiders for industry must not stop there. The trainees must be drilled in the hazards of the work, in the detailed treatment of accidents, particularly acute poisoning. To achieve this the medical officer must maintain a constant interest in his first-aid men, and give them opportunities to see actual cases, and in every way encourage and stimulate them. He should invite them to the ambulance rooms to see such conditions as a septic finger. Fortunately this is a rarity these days, but a first-aider will never forget it, and will appreciate, and preach, the gospel of immediate reporting so-called trivial injuries. Similarly, from time to time, let them see X-rays of fractures, especially of fingers and toes, which we find are so common in the engineering industry.

It must be remembered that when the Chief Inspector of Factories gives a Certificate of Exemption from having First-Aid Boxes in the workshops, this certificate is conditional on the encouragement of employees to report for treatment all injuries no matter how trivial. This will never be achieved by Works rules, but it can be with a keen and loyal body of first-aiders in the shops. The same applies to nursing sisters in industry. There is a tendency amongst first-aiders to get above themselves, and do too much, but this tendency, I find, exists only where they are left on their own. They are much more likely to seek trained professional help where the professionals—the doctors and sisters—take an interest in their work.

I propose to describe the organisation of first-aid cover in my own industry, which is a mixed heavy and light engineering one. It is the policy to have first-aiders in every department, their numbers depending on the risks and on the numbers of employees, and shifts are covered. In each department, or shop, there is a First-Aid Box containing a few dressings and blankets only, and the first-aiders are given the title "First-Aid Box Attendants." They are selected by medical officers, and given a badge, which is worn at all times whilst at work. They are paid an honorarium and their appointment is conditional on their attending classes of instruction and satisfying the Company's Medical Officer as to their competence. These classes are so arranged that the First-Aid Box attendants have their wages protected if the instruction is given in works' time, or a flat hourly rate payment is made should the men be off shift. The function of these Box Attendants is to give strict first-aid to victims of illness or accident, and their lines of communication and responsibilities are clearly laid down. They are really part-time members of the medical staff, and, as such, use their influence in persuading employees with supposedly trivial injuries or minor illness, to report to the Sister, apart from giving first treatment to the more serious cases. Each attendant has a key to the box and a duplicate key is kept in the foreman's office. The boxes are inspected at regular intervals by members of the whole-time medical service, and their maintenance is a direct responsibility of the Division Nursing Sister.

First-aid arrangements at week-ends and during Bank Holidays should not be forgotten. In the engineering trade, factories are normally closed at such times, but experience shows that accidents can and do happen when the factory is idle. To cover these times, it is our practice to equip the Police Department and Fire Brigade with boxes containing basic dressings, and, what is more...
important, instructions on what to do in emergencies.

In large engineering works there is the special hazard which exists in all large factories, namely, electricity. We think it wise to train all personnel in power houses, and all maintenance electricians in methods of resuscitation. In other words, each employee in these departments becomes a first- aider. To keep the men up-to-date, regular lecture demonstrations are given by a medical officer, assisted by a skilled first-aider, or a team of skilled experts in this field.

Turning now to the chemical environment, it is not possible to deal in this paper with all the hazards and their first-aid treatments, but one or two of the more important chemical accidents are mentioned.

**Gassing Accidents.**

In the Annual Report of the Chief Inspector of Factories for 1950, 113 cases of carbon monoxide gassing accidents are reported, of which 22 were fatal. These were to men such as maintenance men, fitters, electricians, bricklayers, who very often work at week-ends, during Bank Holidays, or at night. This again stresses the need for specially trained first-aid personnel to cover these so-called "quiet times" in factories.

The correct treatment for carbon monoxide poisoning from the first-aiders' view-point is immediate removal to pure atmosphere, artificial respiration if the casualty is unconscious, and the administration of oxygen. Until recently pure oxygen should only be available to them. The Medical Research Council have, however, advised the administration of oxygen/CO₂ mixture—93%/7%—has been recommended for carbon monoxide poisoning, and for other gases, such as chlorine or ammonia. The Medical Research Council have, however, advised very strongly against the use of carbon dioxide under certain conditions, would also appear to present a hazard. In all these circumstances the equipment necessary for rescue, such as, fresh air masks or self-contained breathing apparatus, and oxygen, but not an oxygen carbon dioxide mixture. The first-aiders should have constant practice in the use of these appliances, and a good plan is to hold an un-rehearsed drill occasionally.

**Chemical Burns.**

In a plant where corrosive chemicals are made or used, every employee should be trained in the special first-aid. I am taking caustic soda as a typical corrosive, as it is, in fact, one of the most serious. Burns from caustic soda are progressively destructive, and if not given adequate treatment immediately (and immediately means actually on the plant where the burns are sustained) severe permanent disability can result. On a caustic soda plant, therefore, it is necessary to have at suitable points, around the shop, containers of an antidote as well as eyewash bottles for burns of the eye. The usual arrangement is to have the containers of 5-gallon capacity, with a rubber tube and clip and fitted with a dust filter. Immediately a worker sustains a splash of caustic, he is taken by one of his work-mates who is trained, to the reservoir, and the skin and clothing around are immediately drenched with the antidote. As the antidote for skin burns, we use a 5% solution of ammonium chloride. The chemical reaction which takes place is

\[
\text{NaOH} + \text{NH}_4\text{Cl} \rightarrow \text{NaCl} + \text{NH}_3 + \text{H}_2\text{O}
\]

In other words, from a strong alkali, a mixture of a weak alkali (ammonia) common salt and water is produced. If this action takes place without delay, serious damage is most unlikely. The important thing, however, is the training of all employees in the department at risk in this vital first-aid measure.

**Chemical Injuries of the Eyes.**

I am indebted to my colleague, Dr. Lloyd Potter, for valuable information on this subject. In one factory the incidence of chemical eye injuries was found to be very high, and a drive on safety measures was instituted. This drive, which included first-aid training, started in 1948. There was a reduction, nearly 50%, of eye injuries in 1949, a further reduction in 1950 and, I understand, a still further reduction in 1951 and 1952. In propaganda of this kind, the influence of the first-aider is most valuable, because he continuously "sells" safe ways of working, such as, the wearing of shields or goggles.

Early in 1952 there was evidence of a slight rise in eye injuries, the employees having slackened off a little, and a further drive was adopted to "ginger them up," with the expected satisfactory result. This is just another instance of the constant need to keep in close touch with first-aid personnel. Nothing stimulates them more than the interest and encouragement of the medical officer.

In the treatment of chemical burns, the eyewash bottle is an essential part of the equipment, and every employee ought to be familiar with it and its proper use. The solutions of choice will be

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ment is the quantity of the fluid used and not the quality. It is essential to carry out the irrigation with the patient lying down. The first-aider must be taught how to control the lids, as these invariably go into spasm when an irritant chemical has entered the eye. Again, as in body burns the irrigation must be carried out in the plant. [These first-aider men are very keen and it has happened a visitor being shown round the plant, be he a manager, a director, or Cabinet Minister, or even a works medical officer, been seen to rub his eye, is immediately pounced on, put on his back, and his eye washed out, whether he likes it or not. It is far better to submit the distinguished visitor to this operation, even if it is only a speck of harmless dust, than run the risk of missing a small flake of caustic or a minute droplet of acid]. The irrigation should go on for at least ten minutes, after which a clean pad and bandage is applied and the patient taken to the Medical Department, where further treatment is given.

As regards the solutions used for these first-aid measures, there is always water, and water should be copiously used when no antidote is available. For splashes on the body with caustic soda, 5% ammonium chloride is ideal. For other corrosives, the more recent Buffered Phosphate Solution is probably more desirable and it has the advantage of being equally effective with acid and alkali burns. It was first described by Poser & Haas in America in 1943 and is now used by the M.R.C. Burns Unit at the Birmingham Accident Hospital. The formula we use is a modification by my colleague Dr. David Cassells of the original formula. This solution which can also be used for the eyes, has the following composition:

**Original formula**

<table>
<thead>
<tr>
<th>Component</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monobasic Potassium Phosphate</td>
<td>27.22 grms</td>
</tr>
<tr>
<td>Dibasic Sodium Phosphate</td>
<td>71.63 grms</td>
</tr>
<tr>
<td>Distilled water</td>
<td>1 litre</td>
</tr>
</tbody>
</table>

To this is added 0.01 grm of Brilliant Green to discourage the growth of algae, and the solution, in well stoppered bottles, will keep up to four months. As an example of its effectiveness with an acid burn, take Hydrochloric Acid:

\[ \text{Na}_2 \text{HPO}_4 + \text{HCl} \rightarrow \text{Na}_2 \text{HPO}_3 + \text{NaCl} \]

For an alkaline contaminant, take caustic potash:

\[ \text{KH}_2 \text{PO}_4 + \text{KOH} \rightarrow \text{K}_2 \text{HPO}_4 + \text{H}_2 \text{O} \]

Again if normal saline is used it is desirable to add 20 grammes of Boric Acid per litre, again to prevent the growth of fungi and algae.

These few examples are intended to show the value of, or rather the necessity for, first-aid provision on the floor of the shop. Apart from chemical accidents there is the need for preventing shock. Again there is the never ending vigilance to prevent sepsis.

In discussing first-aid, especially at this time of the year, mention must be made of competitions. Most large organisations, such as the National Coal Board, British Railways and others, including my own Company, hold First-Aid Competitions. These competitions are extremely keen in stimulating interest and the spirit of competing teams is extremely keen. The old idea of the team test, where the "patient" had labels tied to him and the team worked to a drill, does not fit in with industrial first-aid. The team test should be realistic, have a distinct factory flavour, and with a little thought, it is easy to "mock up" actual incidents, with explosions, including the "bang" or gas escaping. The "patients" and "bystanders" should be good actors, and I would mention here the excellent work of the Members of the Casualties Union. The individual tests should also be life like. We have adopted the practice of holding the individual pieces in front of an audience with all the necessary effects. Gone are the question and answer and "put-up a fractured collar bone" technique, and in the writer's view, this new style of individual test is more important than the team test, in an industrial organisation.

Mention has not been made of the smaller factories, because I am concerned with the organisation of first-aid in a large group of factories. In my group of factories there are, however, small units with from nine or ten to about sixty employees. In these units whole-time medical cover could not be justified, though a part-time medical officer is appointed. We select an intelligent employee, who may be a member of the staff or on the works pay-roll, and he is given special training in the medical department, under the guidance of the Division Nursing Sister. He is taught clean ways of working, what to treat, and more important, what not to treat. He is also instructed in the most important subject of adequate record keeping. We find that these first-aiders require periodic refresher courses at Headquarters. We have also trained such candidates from other industries, and we are always willing to do so.

With regard to the first-aid organisation in small units where there are no doctors or nurses, and these include the major part of British industry, this I think is another subject. The Factory Act only goes a very little way to solving this problem, with the statutory provision of first-aid boxes and "persons trained in first-aid." The only solution to the problem is a system of group practice, and perhaps in the goodness of time something of this kind will come about.