Hospitals are today faced by the problem of infections, specifically with staphylococci. What can be done to bring this challenge under control? Here is a clear, succinct statement of principles for action.

**STAPHYLOCOCCAL DISEASE — A CHALLENGE TO THE HOSPITAL**

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On October 21, 1854, Florence Nightingale with 38 nurses sailed for the Crimea. The so-called hospitals she found were vast, dilapidated buildings, filthy, bare, and teeming with vermin and infection. There was a lack not merely of medical equipment, but an absence of every convenience for common decency. By superhuman efforts she brought order out of chaos.¹ Today, a hundred years hence, modern hospitals have advanced in many respects compared to the hospitals of Nightingale’s time.

Despite present methods of sterilization, increased knowledge of aseptic techniques, myriads of antibiotics, we may sometimes still feel the frustrations similar to those of a nineteenth century nurse in the realm of infection with specific reference to the threat of staphylococcal disease.

With the discovery of the antimicrobial effects of penicillin by Fleming, Florey, and Chain many thought our problems of infection were solved. Some, in fact, were so confident that they became less stringent in their observations of aseptic techniques. More antibiotics were developed and they began to be used prophylactically along with penicillin. It was believed that infections could not only be cured with antibiotics but that they could also be prevented. Satisfaction with this theory, of course, proved only temporary. With the abundant use of antibiotics, a gradual change in the bacterial population of hospitals was observed. Antibiotic-susceptible forms of staphylococci were eliminated and the more resistant forms were selected. This may have been an evolutionary process implying Darwin’s theory of the “survival of the fittest.” An answer to this challenge was attempted by the production of more, new antibiotics, a process which continues at the present. As staphylococci became resistant, to each new antibiotic, it became apparent that other methods were necessary to cope with the problem which we now face.²

The problem is a serious one. Patients enter the hospital for elective surgery and too frequently the surgeon’s efforts are of little avail because of postoperative wound infections. This results in increased morbidity, great expense to the patient and hospital, and fatality in some cases. It would be ideal for the rate of postoperative infections to be zero; however, 3 per cent and even 10 per cent represent the infection rates of postoperative patients in some hospitals. We should strive to maintain an infection rate of less than 1 per cent.
At the present time this appears difficult to achieve.\textsuperscript{5}

Staphylococcal infections in the newborn nursery have presented a serious problem. This is a situation about which we have not been generally aware, since most infections of infants and mothers occur after discharge. Epidemiologic studies indicate that the following pattern of transmission may occur. The babies are inoculated with staphylococci in the nursery. The microorganisms colonize in the nose and umbilical cord of the infant and are then spread to the skin, bed clothing, and other objects in the nursery. The changing of linen along with other activity permeates the air with staphylococci which are spread to all parts of the unit and new babies may then be inoculated. The average length of time for infants to develop infections is approximately from six to eight days. The mother’s breast is probably infected during nursing and breast abscesses develop approximately 14 days after delivery. This explains why infections usually occur after discharge from a hospital and why nursery personnel may be unaware that an epidemic potential exists within the unit. After discharge of the mother and infant, staphylococci may be spread to other members of the family and recurrent furunculosis may persist in the family for many weeks or even years.\textsuperscript{4,5}

It has been possible with such diseases as diphtheria and typhoid fever to develop vaccines and antitoxins which have proved successful in their control. Similar methods have been attempted in an effort to thwart the onset and persistence of staphylococcal disease. These efforts have thus far not proved very effective. One of the unfortunate characteristics possessed by the staphylococcus is that it comprises a multitude of types. An individual patient prone to staphylococcal disease is not necessarily infected with the same type of organism each time he acquires an infection. Perhaps in the past the tendency was to incriminate staphylococci as a group, since methods to distinguish types were crude if not totally impossible. Recently, laboratories have been able to differentiate one type from another through the use of a method called bacteriophage typing. This is an interesting technic which employs the use of bacterial viruses. Certain viruses will attack only certain staphylococci, which makes them quite specific. The typing method consists of inoculating an agar plate with a culture of the organism. Viruses which have been assigned a number are dropped individually onto the surface of the plate. The plate is then incubated and examined the following day for a pattern of clear zones. These represent the areas which have been attacked. On the basis of this pattern, a bacteriophage type is designated. Approximately 60 per cent of pathogenic staphylococci are typeable, which makes this method, although not perfect, a good tool for tracing the origin of epidemic conditions.\textsuperscript{6}

In various epidemics which have been studied, a so-called “epidemic” or “hot” strain has been incriminated. These well known strains, such as types 80/81 and 44A, as well as others, are usually found to cause the majority of infections in hospitals throughout the world.

One operating room study showed that approximately 12.5 per cent of the personnel entering the operating theater were carrying strains of staphylococci known to cause postoperative wound infections. Among hospital personnel the general nasal carrier rate of pathogenic staphylococci was shown to be highest among residents, interns and nurses, in that order. Patients showed the lowest carrier rates. The incidence of nasal carriage appeared to be proportional to the degree of contact with infected materials. In this study, as well as in other studies, it has been demonstrated that as the number of people in the operating area increases, the bacteria increase pro-
portionally. As the patient is wheeled into the operating room and moved from the stretcher to the table, the bacterial count is high. As motion in the room decreases, the bacterial count also decreases.7-9

In the light of this knowledge, what is the challenge to hospitals? First, we should understand certain principles. Epidemic strains may replace nonpathogenic staphylococci in the noses of carrier patients. In addition, they are acquired and carried by certain members of the hospital personnel and in both patients and personnel they may produce infection. Linen, blankets, mattresses, bathtubs, and other fomites are contaminated by these epidemic strains. Therefore, the hospital appears to be serving as a reservoir for these offending strains.

Methods of control must be based on these principles. Statistics on the incidence of infection should be kept in every hospital. There should be excellent facilities for hand washing, for the proper handling of contaminated materials, for protection of mattresses and pillows by covers which may easily be disinfected. Good housekeeping practices should be maintained with the elimination of dry sweeping and mopping. The proper handling of clean and contaminated linen, the use of rigid sterile technic in the operating room and other familiar practices must receive new emphasis if infection is to be controlled. The separation of patients with staphylococcal infections is also reasonable and important. In this way, contact with epidemic staphylococci may be decreased among other patients and members of the hospital staff. It is important and self-evident that members of the staff must report the presence of their own infections and receive treatment for them.

All hospital personnel have a great responsibility in this endeavor. However, if we are to be lulled into a sense of false security which the indiscriminate use of antibiotics has fostered, and if we ignore these simple premises, we may count ourselves among the important vectors of staphylococcal infection.

REFERENCES


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