STAPHYLOCOCCAL AND OTHER CROSS-INFECTION IN HOSPITAL

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The subject of hospital cross-infection is one that has long exercised the minds of many people. In recent years there has been a spreading prevalence of purulent infection manifest in a variety of conditions from abscesses to pneumonia and fatal septicaemia. These are frequently caused by the 'ubiquitous' or 'versatile' staphylococci, often distinguished by their communicability and virulence and by high resistance to antibiotics. The foci of prevalence are the hospitals where antibiotics have been employed so extensively in recent years, not only for treatment of diagnosed infection but also for prophylactic purposes, often with neglect of the standard routine of asepsis and antisepsis.

The situation is worsened by the capacity of the staphylococci to become resistant to antibiotics. These resistant strains have not only infected patients, but have colonized healthy members of the medical, nursing and housekeeping personnel, and newborn infants, and lie latent in the dust, mattresses, blankets and other inanimate objects of the hospital. Staphylococci are resistant to drying and remain viable for long periods after release from host tissues in almost any inanimate object acting as a depot. Some of the newer antibiotics have proved effective, but these rugged strains show amazing adaptability in acquiring resistance, even to the newer penicillins for which such blatant claims were originally made.

Dr. Cassel,[1] pathologist at Baragwanath Hospital, informs me that he recently investigated 100 consecutive *Staphylococcus pyogenes* isolations in respect of their sensitivity to 'prostaphilin' (oxacillin). Of these, 7 strains were completely resistant to prostaphilin, 3 being untypable and the remaining 4 belonging to group I, type 29. These strains were sent to the Central Public Health Laboratories at Colindale, England, where these findings were confirmed and all the strains were found to be resistant to methicillin.

Staphylococci are grouped according to the types of bacterial virus, or phage, that will attack them. There are 4 main groups—I, II, III and IV—and a mixed group known as 'miscellaneous', each including many different types. The phages are highly selective with respect to the bacterial hosts they attack, but one strain of staphylococci may be susceptible to attacks by several phages of the

same group. The pattern of susceptibility to phages provides a means of identifying particular strains of bacteria and this is important from the public-health point of view in tracing sources and pathways of epidemic infection.

It is now necessary, we believe, to depart entirely from all reference to the so-called 'hospital strain', group I, phage-type 80/81, for this has become so ubiquitous that it no longer confines itself to the hospital environment. So widespread in hospitals has this staphylococcal infection become, that it was soon recognized as a major problem in the better hospitals, where cases were notified and investigated. It is unknown only in those hospitals that lack adequate control and notification. In Britain, it has been computed that the additional stay in hospital resulting from postoperative staphylococcal infection following 1½ million operations in 1 year, is no less than 1 million bed/days per year, the computed cost being £5 million.

The following are the common sites of staphylococcal infection:

*Skin	Furunculosis	*Nose	Furunculosis
	Impetigo	Respiratory tract	Sinusitis
	Pemphigus neonatorum		Pharyngitis
	Other pustular eruptions		Laryngitis
			Bronchitis
			Pneumonia
Breast	Abscess		Lung abscess
	Cellulitis	Intestinal tract	Postantibiotic diarrhoea
*Umbilical stump	Suppuration		Food poisoning
Wounds	Sepsis	Genito-urinary tract	Urethritis
Burns	Sepsis		Cystitis
Eyes	Conjunctivitis		Pyelitis
	Ophthalmia neonatorum		Pyelonephritis
Ear	Otitis externa		
	Otitis media	Blood	Septicaemia

*Also sites for healthy carriers

Staphylococcal Disease Notifiable

The Johannesburg City Health Department has for some time considered the desirability of making staphylococcal disease *in hospitals* notifiable, but has not yet come to a decision. Difficulty will sometimes be encountered in establishing the presence of infection, which may well exist in the absence of frank pus, for example in wound redness, bronchitis, pneumonia, and urinary infections. Unless the clinician is alert to the possibilities, many cases will be missed. Moreover, because of the early discharge of patients from hospitals nowadays, many infections obviously acquired in the hospital do not become manifest until after the patient has returned home. We have communicated with a number of overseas authorities regarding their attitude to the compulsory notification of staphylococcal disease. A summary of the replies is shown below:

Staphylococcal food poisoning is compulsorily notifiable in Austria, Belgium, Cameroons, Canada (Alberta, Nova Scotia, Quebec, Saskatchewan), Congo-Leopoldville, Czechoslovakia, Dominican Republic, France, Germany (Federal Republic), Luxembourg (severe forms), New Zealand, Poland, Switzerland, United Kingdom, United States (Colorado, Iowa, Puerto Rico), and Venezuela.

Impetigo is compulsorily notifiable in Canada (Quebec), Ireland, Luxembourg (severe forms), United States (Colorado, Iowa), and Uruguay.

Impetigo of the new-born is compulsorily notifiable in Canada (Alberta, Nova Scotia, Saskatchewan), Czechoslovakia, and New Zealand.

Staphylococcal muco-cutaneous infections are notifiable in France (optional).

In Illinois (USA) staphylococcal infections in hospitals, or with onset within 60 days of discharge, are notifiable. State laboratories perform phage typing without charge.

In Alaska (USA) all staphylococcal infections are notifiable. State laboratories perform the necessary examinations without charge.

In Ohio (USA) staphylococcal infection is not notifiable at present, but the State is now considering making it notifiable for infants.

In Pennsylvania (USA) hospital-acquired staphylococcal infections have been notifiable since 1958.

In Oregon (USA) all staphylococcal infections shown by laboratory examinations to be coagulase-positive are notifiable.

In Saskatchewan (Canada) coagulase-positive infections have been notifiable since 1956. Bacteriological examination is provided free by Provincial Laboratories, but where hospitals with bacteriological facilities culture directly a charge is included in inpatient payments.

Australia. Breast abscess is notifiable in New South Wales, Victoria, Queensland, and Australian Capital Territory. Staphylococcal disease in newborns occurring in the first 4 weeks after birth is notifiable in New South Wales and Victoria. Confirmation by culture and testing for coagulase can only be provided in cities and centres where laboratory facilities are available. Normally the patient pays for these tests, but provision is made to exempt from payment those who cannot pay.

South Africa. By Government Notice No. 861 of 20 October 1961 the Minister of Health has made staphylococcal infection in mothers and newborn infants a notifiable disease in the municipal area of Pretoria.

The Prevention of Staphylococcal Cross-infection

A warning. Staphylococcal infection is so preponderantly under review that there is a strong tendency to lose sight of infection with Gram-negative organisms like pyocyaneus, proteus, etc., which are at least as serious and even more difficult to eliminate. We have found that nursing staff who should know better are unaware of the existence of these Gram-negative organisms and their role in infection, but they all know of staphylococcal infection; any postoperative infection is designated staphylococcal, even without laboratory confirmation.

Set out below are what we consider the essential principles for the prevention of staphylococcal infection:

1. Adequate and suitable accommodation for patients.
2. Adequate staff.
3. Segregation of source of infection.
4. Limitation of dispersal of organisms from their sources or depots.
5. Protection of susceptible persons and of vulnerable sites.
6. Prevention of contamination of environment, including protection of clean or sterile articles.
7. Decontamination of environment, including disinfection or sterilization of equipment.

DEPARTMENTAL ACTIVITIES

The Johannesburg City Health Department supervises 12 medical and surgical nursing homes and 9 medical and 5 maternity hospitals, comprising 1,578 medical and surgical beds and 147 maternity beds (all for Whites) and also a number of homes catering for the aged. These do not include any institutions administered by the Provincial authorities. The inspectoral staff, directed by an assistant medical officer of health, comprises 4 health visitors

assisted periodically by a health inspector. These health visitors are also responsible for the control of midwives and the investigation of all maternal deaths.

Under powers delegated by the State Health Department, all nursing homes in Johannesburg are required to be licensed annually by the City Council. This local authority control is exercised in the Transvaal and the Orange Free State, whereas in the Cape Province and Natal the Provincial Administration is the controlling authority. The annual review enables the Council *via* the City Health Department to demand compliance with requirements of the by-laws or accordance with public-health principles. Every nursing home must be under the charge of a state registered nurse, or a midwife in the case of a maternity home. Any change of matron or bed space entails a fresh application and the issue of a new licence. A certificate of registration is also issued by the State after receiving inspection reports from the City Health Department.

Apart from the annual inspection for licence requirements, numerous surprise inspections are also carried out. Specific complaints are invariably followed by at least one visit. An effective liaison has been established between the City Health Department and hospital managements, and also with the executive of the Association of Private Hospitals of South Africa.

The Johannesburg Nursing Home By-laws, recently revised and brought up to date, aim at achieving a reasonable standard of hygiene and reducing the risk of infection to a minimum. With this in view, structural requirements are detailed and a minimum ratio of toilets, baths/showers and wash-hand basins to bed space is laid down and similar provision for nursing staff and other personnel. To improve the general standards of hospitals serving the National Health scheme in the UK, the British Subcommittee on Hospital Infection recently suggested a minimum of 8 feet between beds, centre to centre, and 12 feet between beds occupied by septic cases. For nurseries the suggested floor area per crib was 30 sq. feet, and 50 sq. feet in premature babies' nurseries. In Johannesburg, the by-laws require at least 6 feet between beds, centre to centre, no differentiation being made between septic and other cases; at least 800 cubic feet of air space per bed; 20 sq. feet per crib; and a minimum distance of 2'6" between crib and crib.

We have endeavoured to strike a reasonable balance between public-health needs and essential economics. Most of our nursing homes were planned and built long before these standards were laid down, and compliance can frequently be achieved only with considerable re-orientation, reconstruction or sacrifice of beds. There is an understandable reluctance on the part of nursing homes to carry this out in view of the considerable expense or loss of income; all private nursing homes in Johannesburg are maintained as business ventures. Most managements willingly agree that the improvements suggested are in the interests not only of the patients and the professional staff but also in fact of their own boards of directors. Large amounts of money have been spent to achieve these improvements.

In a Government or Provincial hospital the allocation of beds, or even wards, entirely for septic cases, is not of such vital financial concern, even when the beds are not all occupied. It is entirely different in an institution run by private enterprise on business lines, and there is a reluctance to leave any bed unoccupied, even if this entails putting a 'clean' case alongside a septic one. Physicians often tell us how difficult it is to obtain medical beds in private nursing homes. Surgical beds are more lucrative. They accordingly raise no objection whatever, even if their simple pneumococcal pneumonia is bedded alongside a gross staphylococcal infection. The authorities in Great Britain have recognized the need for a drastic revision of hospital bed orientation by planning new hospitals to provide at least 20% of all bed space as single-bed wards permitting of effective isolation, both therapeutic and prophylactic.

Visitors. Control of visitors, particularly in maternity homes, is aimed at reducing the risk of introducing infection. Many authorities are inclined to impose little or no restriction on visitors to hospitals, particularly for child patients. But in our view reasonable control is very necessary; one has only to recall the very real risk of introducing a Coxsackie-virus infection into a nursery of newborn infants and the resulting high mortality from acute myocarditis. Our by-laws permit of considerable discretion being exercised by the Medical Officer of Health should the need arise.

Bacteriological Standards

Recently we considered the advisability of incorporating in the by-laws bacteriological standards for operating theatres and labour and delivery wards. The standards suggested were as follows: (a) For *clean units,* not more than 5 colonies of bacteria per cubic foot of air. (b) For *units in use,* not more than 10.

No pathogenic staphylococci should be present on surface swabbing in clean units.

Williams *et al.*[2] state that in an empty theatre with a ventilation plant running, the number of bacteria per cubic foot of air should be below 1, and that during quiet operating the count ought to be below 5, and preferably below 2. Although the standards we suggested were lower than those recommended by these authors, our proposals did not find general favour, and after much discussion the matter was held up for 1 year while the Department investigated the standards actually achieved in local private hospitals. We set about giving instruction in desirable environmental sanitation techniques, and then began the investigations.

The first phase was in 'clean' units, i.e. units clean and ready for use, after we had given warning of the survey we proposed to make. The reason for the warning was to establish the standard under optimal circumstances. This involved 1,887 separate bacteriological investigations in 12 surgical nursing homes and 5 maternity hospitals. The second phase was also in 'clean' units but with no prior warning. This involved 2,027 bacteriological investigations in the same institutions. The results (November 1962 - January 1963) are shown in Tables I and II. The bracketed figures are the results after due warning of the survey, the unbracketed figures when no warning was given.

After the first survey we wrote to every nursing home giving them the results. Where necessary we criticized them, we visited them, we told them in what respects they fell short, we told them what we thought ought to be done to achieve better results, and we spent a considerable amount of time in each institution trying to educate the management and the staff in what we considered were

TABLE I. BACTERIOLOGICAL TESTS: SURGICAL NURSING HOMES

Nursing home	Operating theatre	Average bacteria per cu. ft. of air	Surface pathogenic staphylococci
A	1	4·4 (27·2)	− (−)
	2	2·4 (9·6)	− (−)
	3	3·8 (4·2)	− (−)
	4	2·4 (5·2)	− (+)
	5	4·2 (5·7)	− (−)
	6	2·7 (5·9)	− (−)
	7	4·7 (6·2)	− (−)
	8	1·8 (13·7)	− (+)
B	1	5·5 (0·5)	− (−)
	2	2·8 (1·5)	+ (−)
C	1	4·2 (16·9)	− (−)
	2	2·3 (15·5)	− (−)
D	1	6·7 (1·4)	− (−)
	2	5·0 (1·6)	+ (−)
	3	12·2 (3·4)	− (−)
	4	5·8 (4·5)	− (−)
E	1	4·6 (3·5)	− (−)
	2	8·9 (3·5)	+ (−)
	3	6·0 (5·7)	− (−)
G	1	4·6 (13·2)	+ (−)
	2	19·2 (36·0)	+ (−)
F	1	5·6 (2·3)	− (−)
	2	19·4 (3·3)	− (−)
	3	14·6 (2·2)	− (−)
	4	16·0 (8·2)	− (−)
H	1	2·0 (4·8)	− (−)
	2	5·0 (3·5)	− (−)
	3	2·2 (4·3)	− (−)
I	1	2·8 (2·7)	+ (+)
	2	3·2 (1·7)	− (−)
	3	8·6 (3·3)	− (+)
	4	7·9 (4·8)	− (−)
	5	3·2 (8·8)	− (−)
	6	4·0 (6·6)	− (−)
J	1	13·5 (16)	+ (−)
K	1	6·2 (4·0)	− (+)
L	1	6·2 (3·1)	− (−)
	2	5·5 (2·2)	− (−)
	3	0·73 (1·4)	− (−)
	4	0·53 (2·3)	− (−)
	5	2·3 (0·9)	− (−)
	6	4·3 (10·7)	− (−)

+ = present. − = absent.

TABLE II. BACTERIOLOGICAL TESTS: MATERNITY NURSING HOMES

Nursing home	Operating theatre or labour or delivery ward	Average bacteria per cu. ft. of air	Surface pathogenic staphylococci
1	O.T.	7·4 (4·8)	− (−)
	L.W. I	9·2 (2·8)	+ (−)
	L.W. II	4·1 (4·9)	+ (−)
	L.W. III	6·6 (4·6)	− (−)
2	O.T.	19·9 (4·8)	− (−)
	L.W. I	2·6 (7·0)	+ (−)
	L.W. II	9·9 (7·3)	+ (−)
3	O.T.	41·0 (9·3)	− (−)
	L.W.	30·9 (9·3)	+ (−)
4	L.W. I	19·0 (2·8)	− (−)
	L.W. II	7·4 (5·8)	− (−)
	L.W. III	9·4 (2·2)	− (−)
5	L.W.	17·6 (19·5)	− (−)

O.T. = operating theatre. L.W. = labour or delivery ward.
+ = present. − = absent.

reasonable procedures. Then we carried out the second investigation, this time without warning.

Many of the results in maternity homes are poor. One reason for this is the fact that a number of them are not provided with air-conditioning units even in theatres and delivery wards, the windows being completely open to the outside atmosphere. We are trying to persuade all of them now to introduce effective air conditioning; much success has already been achieved.

We also carried out similar investigations in those ancillary units such as sterilizing rooms, recovery rooms, scrub-up rooms, etc., where a comparable high bacteriological standard is desirable, but where we did not propose a by-law to enforce it.

We next propose to carry out a bacterial survey of theatres and labour and delivery wards while surgical operations, labours and deliveries are actually in progress. We presume that as the work in these rooms progresses there will be a bacterial build-up in the atmosphere, and the greater the activity the greater the build-up. A detailed investigation of this nature has not to our knowledge been carried out in this country. We have been promised the cooperation of the Association of Surgeons in this project. We have constantly issued warnings against unnecessary movement and talking while operations and deliveries are in progress. In one instance, in the course of an appendicectomy lasting 25 minutes, 57 movements in and out of the operating theatre were counted, almost all of them unnecessary.

In collaboration with the local branch of the Medical Association and the South African Association of Private Hospitals, we have printed and distributed to all nursing homes various posters in both official languages for display at strategic points. They indicate in brief summary what we feel ought to be done in order to reduce the risks of infection. The hospitals have undertaken to appoint senior nursing personnel, e.g. theatre sisters, to ensure full compliance. We find that professional personnel are sometimes extremely lax in carrying out essential procedures in operating theatres and delivery wards (e.g. in taking care that they are suitably garbed) and in this respect anaesthetists, pathologists, blood-transfusion personnel, and technicians, are often gross transgressors. We have seen a prominent surgeon send for his secretary while performing a major operation—his office was in the nursing home—and when she entered the theatre in her outdoor clothes it was to hear that she was to send flowers to someone.

On the other hand, our efforts at education have yielded excellent results in many instances. The theatre sister of one nursing home held up an operation for three-quarters of an hour because the anaesthetist refused to change into theatre garments. She persisted in refusing to send for the patient until he had actually changed, despite the fact that the surgeon paced up and down between the sisters' duty room and the doctors' room mumbling under his breath. Eventually the anaesthetist did change, and he has continued to do so religiously ever since.

Food control. Much time is devoted to improving the general standard of food hygiene in nursing homes. Two teams, each consisting of a White and an African health inspector give talks and practical demonstrations to the kitchen staff, including films and simple instruction about bacteria. For Bantu staff these are given in their own language. A watchful eye is kept on the handling of foodstuffs and the preparation and distribution of meals, and errors are pointed out in the kitchens. Attention is also paid to personal cleanliness, staff quarters, refuse collection and disposal, and the yard environment, etc. At one maternity hospital the kitchen staff have christened our food hygiene staff 'the germies' and great consternation reigns when they arrive.

PRECAUTIONARY MEASURES

Set out below are detailed precautionary measures. No effort has been made to list *all* the precautionary measures. The basis of all such procedures is *good housekeeping*. Maintaining a reasonable state of environmental hygiene is in our view far more important than a constant search for symptomless staphylococcal carriers and their exclusion when found. Naturally, tracing the sources of staphylococcal sepsis to a carrier with an identical phage type is quite a different matter, and the treatment and exclusion of such a carrier from direct

contact with patients is only logical. But in the private nurse one must not lose sight of the economic aspect of such exclusion from work. And the treatment, usually by local applications, is often frustrating, negative and positive swabs coming in rapid alternation.

1. *Surgical and Delivery Units*

(a) Eliminate all unnecessary entries into the surgical or delivery unit *at all times*.

(b) Avoid the use of the major operating theatres for minor surgery, particularly with infection.

(c) Anyone entering the theatre or delivery room *at any time* must wear a gown. Shoe covers should also be worn by all when conductive-type shoes are not indicated.

(d) Shoes for exclusive use in the operating or delivery room should be used by the professional staff.

(e) Keep all doors properly shut and prohibit non-essential entries during operations and deliveries.

(f) Do not take the patient's bed or bedding into the theatre or delivery room.

(g) Dust-control measures should be rigidly enforced.

(h) Keep unnecessary equipment out of theatre or delivery room.

(i) Avoid unnecessary talking and moving about in these units.

(j) Impermeable masks, or at least of double thickness and changed between each operation or delivery, should be worn.

2. *Nurseries*

(a) Detergents containing hexachlorophene should be used for thoroughly washing the hands, wrists and forearms before and after handling each infant.

(b) For those whose skin is sensitive to hexachlorophene, surgical gloves may be worn during duty, observing the above technique in washing; or, after careful washing with soap before and after handling each infant, residual antiseptic creams containing chlorhexidine should be applied to the hands several times during each spell of duty.

(c) Newborn infants, unless it is contraindicated for medical reasons, should be bathed soon after birth and every other day thereafter, a liquid detergent containing 3% hexachlorophene or hexachlorophene soap being used.

(d) Infants should be weighed only on admission to the newborn nursery and on discharge unless otherwise medically indicated.

(e) Care of the umbilicus: Triple dye or hexachlorophene dusting powder should be used daily until the cord separates.

(f) Incubators and cribs should be scrupulously cleaned after occupancy, suitable antiseptics and, if available, ultraviolet light being used.

(g) All nursery linen should be autoclaved before being taken into the nursery.

(h) Before entering a nursery the hands should be scrubbed and *gowns should be donned by all*. All persons on duty in the nursery should wear clean gowns and caps that properly cover the hair. All others who enter the nursery for any reason should in addition wear masks. Gowns worn while on duty in the nursery or delivery section should not be worn in other parts of the hospital.

(i) In the nurseries, daily cleaning should be timed to take place when most infants are out of the nursery.

3. *Personnel*

(a) Prompt reporting of all cutaneous infections and other illnesses among hospital staff.

(b) Doctors with such infections should not operate.

Factors in the Patient Increasing Danger of Staphylococcal Infection

The following increases the susceptibility to infection: (a) treatment with steroids; (b) physical debility; (c) chronic disease; (d) prematurity; (e) diabetes; (f) bed sores; (g) open wounds or breaks in the skin; (h) chronic pulmonary disease.

The following make patients more likely to acquire staphylococcal infection: (a) routine indiscriminate use of antibiotics, especially for 'prophylaxis'; (b) long stay in hospital; (c) contact, direct and indirect, with infected hospital patients or staff; (d) crowding and inadequacy of facilities; (e) prolonged operative procedures; (f) prolonged use of continuous parenteral therapy through venipuncture or indwelling tubing.

POSTOPERATIVE SEPSIS IN A PARTICULAR NURSING-HOME UNIT

A short while ago we were confronted with alarming reports of a high incidence of postoperative sepsis in a highly specialized surgical unit housed in a prominent local nursing home. There were two surgical teams whose patients occupied the east and west wings (E and W) respectively of the same floor. Investigation revealed that almost all the sepsis occurred in E, usually on the 7 - 10th postoperative day. Sepsis in W was singularly absent. While both wings used a common operating theatre, the theatre staff were not entirely common to patients from both wings. The floor and professional staff of each wing was almost entirely self-contained.

Having obtained this bird's eye view of the general situation we proceeded to lay down a plan of action and this is briefly what we did in each section. We felt justified in ruling out the theatre from the point of view of environmental sanitation as this was common to both wings, but not the theatre staff.

We prepared a layout plan of the floor area, bed space and occupancy of each ward.

We determined the bacteriology of the cases of sepsis and tabulated the type of case occupying each bed in both wings.

We listed the different categories of staff, both White and non-White, in each wing by name, and we set out their functions. We then took nasal swabs of every member of the staff, 78 in number, and detailed the results.

To determine environmental conditions, we took aerial samples and surface swabs from wards, dressing rooms, linen rooms, sluice rooms, etc., and swabs from cleansing materials, antiseptic solutions, syringes, wash basins, and a host of other sites. To ascertain blanket contamination, we did both a blanket 'press' and a blanket 'sweep' in the wards. We repeated the ward aerial samples during periods of varying activity, such as during and after bed-making, at meal times, and at visiting times.

We investigated the artificial ventilation system.

We observed and detailed all the pre-operative and post-operative procedures carried out by the nursing staff, including their scrubbing-up and wound-dressing techniques. We noted the method of disposal of dirty dressings and the handling of clean dressings. We investigated sterilization procedures and tested the end results.

We noted the general state and cleanliness of the two wings and we compared the cleaning procedures. We listed the clean and dirty linen arrangements and the treatment of bed linen, including blankets, and watched and compared the methods of bed-making in the two wings.

We noted the general appearance of the nursing and other professional staff and their uniforms and also the non-White staff. We searched or enquired for obvious sepsis among all the staff.

We went into the procedure adopted with actual cases of sepsis both pre-operative and postoperative and we noted the so-called barrier-nursing techniques.

Considerable use is made of postoperative bedside X-rays on this floor and we noted how this was done.

We talked to many of the floor staff to determine their knowledge of asepsis and their general morale. This was most informative.

In all we took 78 nasal swabs, 186 aerial samples, 46 blanket tests, and 359 other surface swabs, a total of 669. By this time the laboratory results were beginning to arrive and we tabulated them. *In summary* this is what was revealed:

TABLE III. HOSPITAL PERSONNEL OF EACH WING: NASAL SWABS FOR *STAPH. AUREUS*

Category	Wing E			Wing W		
	Number swabbed	Positive Staph. aureus	Percent. positive	Number swabbed	Positive Staph. aureus	Percent. positive
Nursing sisters ..	14	3	21·4	13	3	23
Nurse aides	7	3	42·8	7	3	42·8
Non-White staff ..	5	1	20	3	1	33·3
Theatre nursing staff	5	1	20	5	Nil	Nil
Administrative staff	3	Nil	Nil	3	Nil	Nil
Medical professional staff	6	Nil	Nil	9	4	44·4
Technical staff ..	2	Nil	Nil	2	Nil	Nil
Physiotherapists ..	3	2	66·6	3	2	66·6
Total	45	10	22·2	45	13	29

TABLE IV. HOSPITAL PERSONNEL OF BOTH WINGS (E + W): NASAL SWABS FOR *STAPH. AUREUS*

Category	Number swabbed	Positive Staph. aureus	Percentage positive
Nursing sisters	26	6	23·1
Nurse aides	14	6	42·9
Non-White staff	8	2	25
Theatre nursing staff	7	1	14·3
Administrative staff	3	0	—
Medical professional staff ..	13	4	30·8
Technical staff	2	0	—
Physiotherapists	5	3	60
Total	70	22	28·2

TABLE V. AERIAL SAMPLES FROM EACH WING

Wing E:	No. of aerial samples	110
Wing E:	Average colonies per cu. ft. or air	76·7
Wing W:	No. of aerial samples	76
Wing W:	Average colonies per cu. ft. of air	46·73

TABLE VI. ORGANISMS IN AERIAL SAMPLES AND BLANKET-PRESS SAMPLES FROM EACH WING

Wing	No. of aerial samples and blanket-press samples	No. of specimens from which organisms isolated			
		Ps. pyocyaneus	Coliforms	Staph. aureus	
				No.	% of total
E	131	nil	nil	27	20·6
W	113	nil	nil	4	3·5

TABLE VII. BLANKETS—COLONIES PER PLATE FROM EACH WING

Wing	Private ward		2-bed ward		4-bed ward		6-bed ward	
	P	S	P	S	P	S	P	S
E	49	216	64	100	Innumerable		208	800
W	34	56	112	164	248	360	400	468

P = press. S = sweep.

TABLE VIII. STATISTICAL BACTERIOLOGICAL COMPARISON (EXCLUDING PERSONNEL)

Wing	No. of swabs taken from inanimate objects	No. of swabs from which organisms were isolated					
		Ps. pyocyaneus		Coliforms		Staph. aureus	
		No.	% of total	No.	% of total	No.	% of total
E	234	10	4·3	9	3·8	35	14·9
W	183	1	0·6	3	1·6	13	7

TABLE IX. BACTERIAL COUNTS PER CU. FT. OF AIR FOR EACH WING

Wing	Bed-making			
	No activity	Start	Middle	Completion
E	9·0	24·8	231	321
W	5·0	26·1	45	136

We concluded that the higher postoperative sepsis rate in wing E was associated with poor environmental sanitation, and we learned from questioning that the nursing staff in this section were indifferent and had a sense of frustration about the problem of sepsis. By contrast the staff in W were enthusiastic, keen, and more knowledgeable about sepsis. In both sections there was considerable scope for improvement in dressing technique. The results would appear to indicate, too, that the staphylococcal nasal carrier played but a minor role in the incidence of staphylococcal sepsis, as evidenced by the fact that W, where almost no sepsis occurred, had a higher carrier rate (29%) than E (22·2%), which had a high incidence of sepsis. The steps we subsequently took succeeded in eliminating sepsis from this floor completely and there has been practically nothing for 9 months or more (July 1963).

We have now drawn up a course of in-service training in this field and have offered it to nursing-home nursing personnel. The course will consist of 5 one-hour sessions of lectures, films and discussions, with stress on the need for constant vigilance. Thus far (July 1963) the response has been most disappointing. However we have not abandoned all hope of success.

SUMMARY

1. A brief general summary is given of the background to hospital cross-infection.

2. Mention is made of the present world position regarding staphylococcal infection as a notifiable disease.

3. Departmental activities in the control of nursing homes in Johannesburg are described, and details of the bacteriological findings in two extensive surveys of the surgical and maternity nursing homes in the City are set out, with particular reference to operating theatres and labour and delivery wards.

4. Details are also given of an investigation following disturbing postoperative sepsis occurring in a highly specialized surgical unit in a Johannesburg nursing home.

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