

Medical History

Anaesthesia and the flying surgeon service 25 years on

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Introduction

Queensland's flying surgeon service has provided elective and emergency surgical care for an area covering about 40% of the state for more than 25 years. During this time the teams have flown in excess of 3.5 million km, the pilots have logged more than 16 000 hours, and over 30 000 operations have been performed. Despite this little is known of the service outside Queensland, and it is frequently confused, even in Australia, with the better known Royal Australian Flying Doctor Service. We both worked for the service, 25 years apart, and hence had an unusual opportunity to review the development of anaesthesia and other changes that occurred during those years.

History

The service was set up in 1959 by the State Health Department to meet the growing need of the widely scattered population of western Queensland for specialist surgical facilities. It was, and still is, the only such service in the world. Even today it is difficult to attract doctors to work in some of the very isolated townships, and because of the shortage of doctors 25 years ago the hospital "superintendents" were often quite inexperienced graduates working out their government service "bond." In an emergency their isolation left them no option but to attempt sometimes complex surgery, while maintaining responsibility for the anaesthesia (open ether) that they had induced and then handed over to the hospital matron. These single handed practitioners were also isolated from medical advice, discussion, and moral support, as communication over the long distances was often unreliable. The advent of the flying surgeon service, based at Longreach, the geographical centre of the area, brought reassuring support to these doctors and improved the quality of surgical care for the patients.

The first aircraft used by the service was a slow, single engined Cessna 182. With a cruising speed of around 120 knots and minimal navigational equipment, covering the vast area meant long hours in the air and many nights away from base. A large amount of heavy medical apparatus had to be carried at all times, and the consequent increase in fuel consumption limited endurance. Within a year it had become obvious that the workload could only continue to increase, and 1960 saw the introduction of a faster, twin engined Cessna 310 aircraft, which meant an increase in scope in terms of both area and speed. It also made the work considerably safer and

meant fewer nights spent away from home for the team, which consisted of the pilot, surgeon, and anaesthetist (fig 1).

Figure 2 shows how the work of the service has grown since then, with increasing numbers of miles flown and patient consultations. 1963 was something of a milestone in the anaesthetic history as it saw the introduction of halothane; largely, it seems, because the team had recently acquired a portable diathermy apparatus and was concerned that its use in combination with open ether in small operating theatres might have resulted in the early demise of the service. In 1964 the team produced its first report of prolonged respiratory insufficiency, later attributed to cholinesterase deficiency. "The first half million miles," an article by the service's surgeon, anaesthetist, and pilot, was published in the *Medical Journal of Australia* in 1964,¹ and in 1969 the one million mile mark was passed. Throughout the 1970s the increasing populations were reflected in growing numbers of consultations and surgical procedures, although because of the changing fortunes of the country townships some were replaced by others on the visiting schedule. By 1980 it seemed logical to consider a second team, and a new base was established at Roma. This changed the pressures on the team considerably, as for the first time crossover could be employed, allowing adequate time for aircraft servicing, which had always been a problem, as well as affording reasonable rest periods for both teams.

The service today

Figure 3 shows the areas covered by the teams based at Longreach and Roma. The day's work begins for the pilot before dawn, about an hour before the usual take off time. Before each flight he must

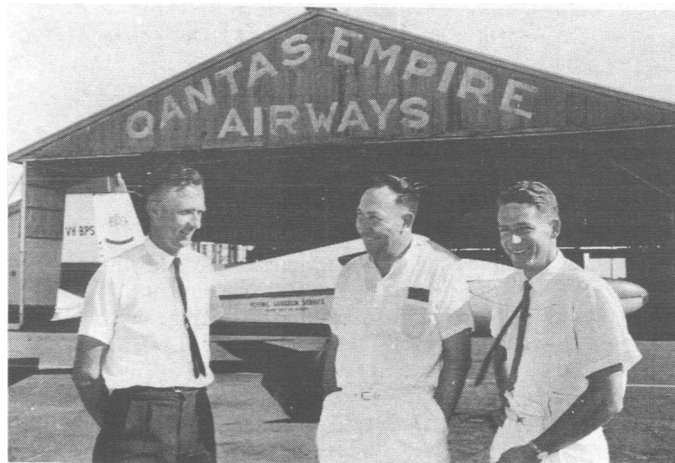


FIG 1—The 1960 flying surgeon team: (from left to right) Captain S Bartrum (pilot), Dr C Cummins (surgeon), and Dr W Biggs (anaesthetist). The hangar in the background was the first operational base of QANTAS and is still in use.

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study weather reports, submit flight plans, and ensure that the aircraft is fully checked out. The team is normally airborne by 7 am. Most of the hospitals visited can be reached within two hours' flying time, which means that most can be serviced on a one day basis, although some of the more distant towns still require an overnight stay to allow a full day's operating time. The aircraft used by both teams today is still a Cessna 310, which has proved very suitable for the service. These aircraft are, however, considerably more sophisticated in terms of equipment and reliability than those of 20 years ago and carry modern navigational aids and weather radar. The pilots, who hold senior commercial class licences, can fly these aircraft in all but very severe weather conditions, day and night. The safety record of the service is impeccable. Although the aircraft are capable of pressurisation, oxygen is not carried on board because of the amount of heavy surgical equipment that is still transported, and cruising is therefore limited to below 10 000 feet.

The standard of the runways of the small townships visited has improved considerably over the years. Most now have bitumen strips and electric, pilot operated landing strip lights. One or two, however, still require hand lit kerosene flares for night use, and in these places the pilots usually make a special effort to be airborne by last light. Many of the aerodromes are also fitted with non-directional navigational beacons, which are invaluable to the pilots when they are navigating over some of the featureless terrain.

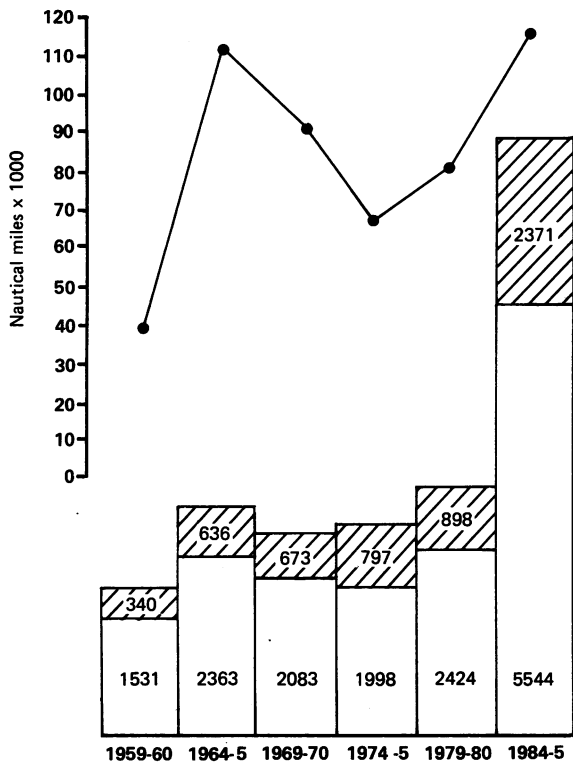


FIG 2—Distances covered and numbers of consultations (□) and operations (▨) performed by the service 1959-85.

After landing on the runway, the team is met by a member of the hospital staff and the necessary surgical instruments and other equipment are transferred to their vehicle. At the hospital the superintendent, senior nursing staff member, surgeon, and anaesthetist conduct a ward round to review the day's patients, most of whom have been seen on the previous visit. (The team must be prepared for anything; in 1983-4, for example, eight of the injuries treated were caused by horses, three by fights, three by guns, two by waterskiing, one by a knife, and one by a bull.) Premedication is arranged as appropriate, and while this takes effect on the first patient the team sits down to breakfast. (An occupational hazard of this job is that as the visit of the surgical team is a "big day" for the

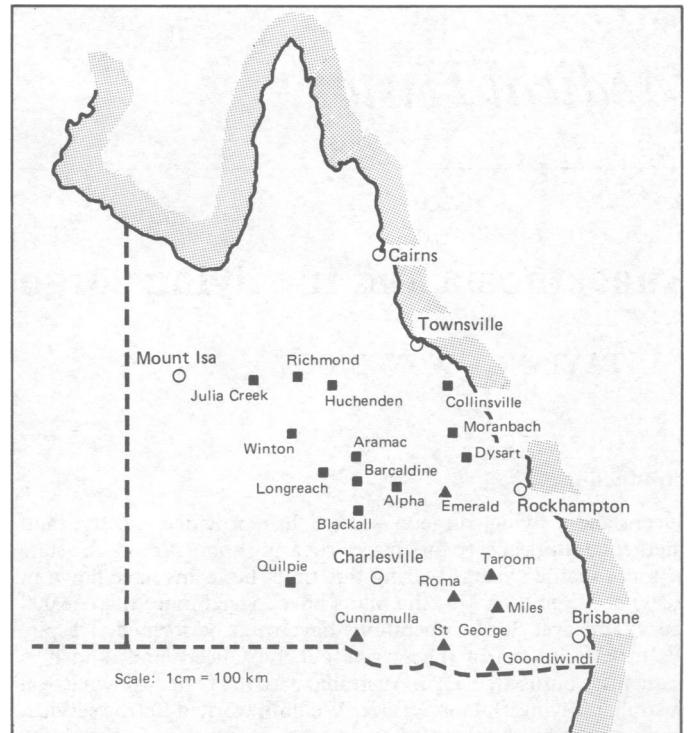


FIG 3—Areas covered by the two teams. ▲ = Towns serviced by team based at Roma. ■ = Towns serviced by team based at Longreach.

small hospitals every day is "big" for the team. Outback Australians' hospitality is as legendary as their appetites, and weight gain is inevitable unless care is taken.) Operating sessions begin around 9 am; the lists are very variable and include general surgery (55%); ear, nose, and throat surgery (5%); minor plastic surgery (5%); obstetric and gynaecological surgery (20%); and orthopaedic surgery (5%). There is also increasing use of diagnostic procedures such as gastroscopy, colonoscopy, and ultrasound scanning. Careful planning of the list usually allows such procedures to be performed while local or general anaesthesia is being induced for the next operation. At the end of the operating session outpatients are seen, the surgeon referring any of those coming for surgery to the anaesthetist at this stage. This allows adequate time for appropriate investigation to be arranged or performed by their local doctor before the next visit.

Occasionally, a decision must be made whether it is in the patient's best interests to perform a particular operation at that hospital. The decision to transfer a patient to a coastal hospital is not one that is made lightly; quite apart from the cost to both the patient's family and the hospital many country people dislike and distrust the cities and will often express a strong preference to "stay and take my chances."

Emergency calls occur about twice a week and vary from the fairly minor to severe trauma. In one year the causes of severe trauma ranged from multiple or major fractures (12 cases) to head injuries (five cases), ruptured liver or spleen (five cases of each), and chest injury (two cases). Despite the long distances, the service aims at having a seriously injured patient in the operating theatre in a time comparable to that taken to transport and admit a similar patient through city traffic, etc. Frequently, less urgent cases can be dealt with by making a diversion to the hospital on the way back to base, hence avoiding the need to cancel the day's cases at the first hospital, to which patients may have travelled long distances to be treated. Obstetric emergencies probably cause most anxiety, and perhaps for this reason a higher than average caesarean section rate is accepted, there being little justification for the local doctor risking such things as twin delivery or breech extraction without immediate access to operating theatre facilities and the appropriate skill.

Anaesthetic considerations

The evolution of the role of the anaesthetist with the flying surgeon service has reflected the changing growth and development of the speciality generally. Though it has been accepted from the beginning that the unusual nature of the work demands a versatile, well trained, and truly general surgeon, recognition of the need for similar attributes in the anaesthetist has lagged behind. The initial designation of the post was "medical officer to the flying surgeon," and to fill the position many "bonded," fairly inexperienced graduates have been employed. After a minimal training period (three months spent in a teaching hospital's anaesthetic department) these doctors were sent out to cope with all types of anaesthesia, for surgery on patients ranging in age from neonates to 90 year olds. It is to their credit, and to that of the Australian medical training, that the service has such a good record. Interestingly, many of these doctors have since gone on to become specialists in anaesthesia, although whereas there have been only four surgeons in the service's history there have been 16 anaesthetists.

Twenty five years ago the anaesthetic facilities facing the medical officer were far from ideal. Only five of the 28 hospitals then visited had their own anaesthetic machines of the CIG Midget or Boyle's design. A CIG Midget machine therefore had to be transported on the aeroplane, in addition to an extensive array of laryngoscopes, tubes, and assorted fittings and all the required drugs. All the hospitals had to maintain their own supply of nitrous oxide and oxygen by road or rail, because of their weight. Ether was the mainstay of the volatile anaesthetics, the first Fluotec not being introduced until 1963. Few, if any, of the small outlying hospitals had electrocardiography machines or defibrillators, and ventilators were almost unheard of.

Preoperative assessment had to be performed at the first consultation, as the team had to wait several days for the results of any pathology tests that might be thought necessary. Crossmatching required samples to be sent several hundred miles by air. Urgent operations, particularly those associated with severe electrolyte imbalances, caused a considerable problem, as assessment had to be entirely clinical. In these instances crossmatching had to be performed by the anaesthetist. The high temperatures, particularly during the summer months, presented an additional hazard. In addition to the discomfort of those performing the surgery hyperthermia was a real risk to the patient, and the use of atropine in premedication was virtually contraindicated.

Today, all the hospitals are suitably equipped with anaesthetic machines, mainly of Boyle's pattern, and some even have piped gas supplies to the theatres. Most have some form of automatic ventilator, and all have an electrocardiographic monitor and defibrillator which can usually be commandeered for use in theatre. Disposable needles, syringes, and tubes have reduced the amount of equipment that the anaesthetist has to carry, most of which can now be accommodated in one bag. Improved transport services have made it possible to have results available in hours rather than days, and in some centres the local doctor may run minor pathology services—for example, tests for haemoglobin, urea, and electrolytes—himself. Crossmatching is still a problem in emergencies, but if lifethreatening blood loss occurs group specific blood is available at remarkably short notice from a "walking donor" pool in most townships. This provides the unexpected advantage that all blood given in such emergencies is fresh (and usually warm). On one occasion, a patient with severe crush injuries had 35 units of blood transfused during surgery lasting more than four hours. At the end of this time blood clotting, as judged by clinical observation, was unimpaired.

The delay caused by the need for patients to have recovered from the effects of anaesthesia adequately by the time the team leaves has been made reduced by the availability of newer short acting drugs. Regional anaesthesia, although always recognised to have many advantages, was not practised much until quite recently, partly because many of the anaesthetists had little training in its use and also because of the lack of disposable needles and the sometimes questionable sterilising facilities during the early years. Over the past few years increasing use has been made of local anaesthetic

techniques, particularly spinal and brachial plexus blocks. Most of the theatres are now air conditioned or have adequate cooling fans, so that the operating conditions are more comfortable. There is still a risk of hyperthermia in the summer, however, when temperatures during the day may reach above 45°C.

The adequacy and quality of help available to the anaesthetist may vary considerably according to the number of nursing staff in the theatre and their level of training. Over the years, however, it has become quite common for the pilots to act as assistants, and they have become very reliable in this voluntary role, competently administering cricoid pressure, helping to set up intravenous infusions, and on occasions even repairing faulty equipment.

The future of the service

With Australia's economy still being predominantly dependent on the primary producers it seems that country life will continue in much the same way for many years. The country towns will probably change little in size, and few, in the foreseeable future, will have the clinical work to justify full time specialists. Yet such facilities must be available to these townships, and the flying surgeon service has been shown to be the most cost effective means of providing them. The alternatives, of transporting patients to the coastal cities for surgery or flying out specialist teams as and when required, would be much more expensive and inadequate in emergencies. The volume of the service's work has been more or less constant over the past few years and will probably remain at this level, but local changes are to be expected, particularly in the towns connected with minerals and mining, whose populations tend to be influenced by the changing economic climate. The range of surgery will probably remain much the same for some time, as the operations performed currently are as much as these small hospitals can reasonably be expected to cope with. The increasing tendency to subspecialise early in medical training may make it difficult to find surgeons of sufficient versatility to replace the present ones.

Reliance on such inexperienced doctors to fulfil the anaesthetic requirements of the service can probably no longer be justified, despite their achievements in the past. The Roma based team has had a specialist anaesthetist for several years, and a similar appointment will probably be made in the Longreach team in the near future. This should not only be beneficial to the patient but also relieve the surgeon of the responsibility that he has inevitably felt with a high turnover of fairly inexperienced doctors in recent years. For the new anaesthetist the job offers varied and challenging experience, an unusual and interesting lifestyle, and the excitement of unpredictability.

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Reference

- 1 Cummins CFA, Biggs WW, Whiting JC. The first half million miles. *Med J Aust* 1964;ii:348.

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Do herbal teas have any proved use in weight reduction?

Herbal teas are usually consumed without milk and sugar and so have a low energy content, especially when compared with alcoholic beverages. They would therefore make a slight contribution as part of a controlled energy diet. There is no evidence that they possess any special properties in respect of weight loss. ¹—D A T SOUTHGATE, head nutrition and food quality division, AFRC Institute of Food Research, Norwich.

¹ Bender AE. *Health or hoax*. London: Elvendon Press, 1985.