Journal of
Environmental and Social Sciences

Open Science Publications

Volume 2, Issue 2 - 2015

www.opensciencepublications.com

Kalgoorlie Hospital, Western Australia 1895-1897, the First Five Months of Hospital Admissions, and Typhoid in the Gold Fields

Review Article

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Article Information: **Submission:** 15/07/2015; **Accepted:** 20/08/2015; **Published:** 26/08/2015

Abstract

Lessons from history can assist in management today by avoiding errors of the past. Kalgoorlie is a remote city in the Goldfields of Western Australia 600kms east of Perth with a current population of about 30,000. When gold was discovered there in 1893, thousands of optimistic prospectors flocked there before the development of any community infrastructure. A tent city and then a tent hospital developed, dealing with the problems inherent in remote mining communities lacking clean water and sanitation. Bars, beer and brothels traditionally arrive soon after mining strikes in Australia. Trauma, violence, typhoid and other infections including venereal diseases were common. The unusual feature is that the current Kalgoorlie Base Hospital archives records of admissions and discharges dating back to 1896. The clinical details of the first 298 inpatients admitted between 1st December 1896 and 27th April 1897 are presented.

Introduction

Kalgoorlie, now known as Kalgoorlie-Boulder after Kalgoorlie and Boulder communities joined, is a city in the Goldfields-Esperance region of Western Australia, Australia, located 600 kilometres east-north-east of Perth at the end of the Great Eastern Highway. The name Kalgoorlie is derived from the Wangai word Karlkurla, meaning "place of the silky pears".

In January 1893, three prospectors, Paddy Hannan, Tom Flanagan, and Dan O'Shea passing through the area noticed signs of gold in the area, and stopped. By June 1893, Hannan had filed a claim, and hundreds of men swarmed to the area, some pushing wheelbarrows or riding wooden bicycles from Perth, in search of gold and the town of Kalgoorlie was born. The arrival of tens of thousands of people before the development of infrastructure and with unhygienic conditions, unclean water, and inadequate disposal of waste rapidly led to an epidemic of typhoid or enteric fever as it was also known. Working exposed to the Australian sun can be extremely dehydrating, and today many labourers carry ten litres of water per day.

The author (PS) while working in Kalgoorlie hospital experienced temperatures up to 47 ˚C, and had a 19 year old male with no previous renal disease admitted with a creatinine over 300mmol/L in spite of consuming five litres of water during a day exposed to the sun in January. He responded to intravenous saline with full recovery within 24 h.

ISSN: 2454-5953

It was impossible over 100 years ago to find ten litres of clean water as workers carry today, and the prevalence of typhoid increased in very hot spells as in 1902 when a heat wave with shade temperatures over 100°C resulted in over 90 cases in the Kalgoorlie Hospital [1].

In 1895 a hospital opened, initially in tents, and subsequently in more permanent buildings. Records are available in the hospital archives dating back to 1896 of early admissions, two-thirds of whom were suffering from enteric fever caused by clinically identical infection with either of the water or food borne *Salmonella enterica* serotypes Typhi and Paratyphi.

By 1898 the town population was 2,018 (1516 males and 502 females), increasing to 30,000 people in 1903, much the same as the population of 31,107 at the 2011 census. The area with a population exceeding 200,000 in the 1890s gained a notorious reputation inhabited by gamblers, bandits and prostitutes. By 1902, the town had 8 breweries, several brothels and 93 hotels, some still functioning today as some of the finest examples of mining town architecture in the world.

The mining of gold along with other metals remains a major industry in Kalgoorlie today, employing a quarter of Kalgoorlie's workforce, and generating a significant proportion of its income. The central gold field area, known as the Golden Mile, is thought to be the richest square mile on Earth. Kalgoorlie was connected by rail to Perth in 1896 and to Port Augusta in South Australia in 1917. A fresh water pipeline bringing in fresh water from Perth opened in 1903.

The History of Typhoid

The Typhoid bacillus was first detected and identified in 1880 by Karl Eberth and confirmed as the cause of the disease by Georg Gaffky in 1884, but it is considered to have been the cause of many past outbreaks of infection with associated high mortality, for example the Athenian plague of 430BC, which killed a third of the population including Pericles and the disease which wiped out the English settlement of Jamestown, Virginia, USA in the early 17th century. It is thought to have caused the death of over 80,000 soldiers in the American Civil War.

The association of typhoid with poor sanitation and disposal of sewage was well known by the 1890's. Patrick Manson in his text *'Tropical Diseases'* notes the frequency of the disease in Europeans soon after arrival in unsanitary places in Asia, particularly from drinking contaminated water [2]. He writes:-*'Similar testimony has come from Australia, where typhoid has occurred in the back country in lonely spots, hundreds of miles from fixed human habitation '*

William Osler was the leading global medical authority when gold was discovered in Kalgoorlie. His text *'The Principles and Practice of Medicine'* describes the diagnosis and management of typhoid at the closing of the 19th century [3]. Osler acknowledges the work of Eberth, Koch, and Gaffky in identifying the causative organism, *'a short, thick, motile bacillus with rounded ends which grows readily on various nutritive media'*. He considered that '*In cities the prevalence of typhoid fever is directly proportionate to the inefficiency of the drainage and the water supply*'. Osler noted that the mortality varied from 10-30% in different outbreaks. Improved sanitation and vaccination introduced late in the 19th greatly reduced mortality.

Diagnosis

Clinical features are not available from the Kalgoorlie Hospital records and the accuracy of the diagnosis of typhoid is pivotal to this paper. Osler [3] considered the presence of rose-coloured spots and splenomegaly were key features on examination. Connor reported rose spots in 5-30% of cases, (blanching erythematous maculopapular lesions usually 2-4 mm in diameter) usually on the abdomen and chest [4].

The history of a pre-febrile phase with headache, malaise, bronchitis and anorexia, followed by a febrile illness with diarrhoea was strongly suggestive of typhoid. Osler considered splenic puncture to obtain a culture was rarely justified.

Management

In the pre-antibiotic era, Osler [3] believed medications were of no avail and that careful nursing under an intelligent nurse was critical in the management of seriously ill patients in the era also before intravenous fluids. He advised a low residue diet predominantly of milk with plenty of water, but alcohol only for weakness, high fever or a weak pulse. Patients with a high fever over 102.5°F should be immersed in a cold bath every three hours, and severe diarrhoea was treated with starch and opium enemata. Acetate of lead and opium were recommended for haemorrhage. Osler recognised that neurological features, peritonism and heart failure, for which he recommended alcohol and strychnine being uncertain of the benefits of digitalis, indicated a poor prognosis.

The Kalgoorlie Hospital and typhoid in the goldfields

There were three phases in the development of a hospital in Kalgoorlie in the 1890s, a funding and planning phase, the initial tent hospital, and the finally a permanent construction with extant archived patient records commencing about the date of opening the initial buildings.

Planning

By 1894, the citizens of Kalgoorlie perceived a need for their own hospital, similar to the nearby Coolgardie Hospital opened the previous year. A meeting at the Exchange Hotel was proposed in December 1894 to commence fund raising, initially with a sports event [5].

Motivated *citizens with various relevant skills were gathered into a committee to drive the construction and opening of this establishment, which would be initially under canvas. They considered that the building should be constructed of stone similar to the Coolgardie Hospital, and that the State Government should pay the costs as they had in providing hospitals for the citizens of Perth.* The hospital doctor requested that a portion of the miners subscriptions to the hospital should be handed over to him as extra salary, but the committee replied they "cannot entertain his proposal [6]."

The Tent Hospital

Kalgoorlie Hospital opened in canvas tents by March 1895, with Ms Alerdice as the first matron. *Prior to the opening a temporary structure known as Hannan's hospital received a few patients* [7].

In September a miners' public clinic between 1000 and 1100

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hours and again between 1900 and 2000 hours was commenced. The committee requested a district sanitary inspector and an improved water supply from the Government to reduce water-borne diseases among the rapidly increasing population.

Fortnightly fund raising smoke concert were organised, and the positions of hospital medical officer with private practice for £200 per annum, and of a matron, for £151 per annum with free quarters were advertised [8].

In an era before mass production of cigarettes and the obvious adverse effect of tobacco, the hospital doctor, Dr. O'Mahon, presided over a well-attended concert and smoke social in Waldack's Club to raise funds for the Kalgoorlie Hospital [9].

Miss Bessie Way, daughter of Dr. E. W. Way, honorary surgeon and board member of the Adelaide Hospital, and niece of the deputy Governor of South Australia Chief Justice Way, successfully applied for the position of matron. She was described as a highly accomplished nurse following the best possible training at the Adelaide Hospital [10,11].

Little information about typhoid in the Kalgoorlie district is available before 1896, but Dr Barber reported three deaths from typhoid in six months between August 1895 and February 1896, and then a slight increase in the mild cases of typhoid admitted to the Kalgoorlie hospital in January. With unfortunate and erroneous optimism saw no reason to anticipate any serious outbreak of typhoid in the district [12].

In February 1896, the tent hospital had 24 beds. The hospital organisation was criticised in the local paper when four patients were refused admission due to the lack of available beds, in spite of the apparent availability of four other large tents which could have been erected immediately [13]. In March 1896 the Works Department accepted a tender to erect hospital tents containing thirty extra beds. The tents were made of navy canvas erected under a single iron roof to shelter nursing staff passing from ward to ward [14].

In March 1896, a Mr Geoghegan complained to the local newspaper about a gentleman refused hospital admission without medical review in spite of severe pain. Dr J.A. O'Meehan, the R.M.O. defended his patient care by responding that the complaint was somewhat exaggerated as the patient had a boil on his leg requiring outpatient treatment. O'Meehan stated that the hospital was open for public inspection on specified afternoons, an idea which could be adopted today [15]. Enteric fever became more prevalent during February when Dr. O'Meehan reported 24 admissions suffering from typhoid with one death, amongst a total of 41 admissions with five deaths [16].

Bishop Gibney stated that the new St. John of God Kalgoorlie Hospital building would be open at all hours of the day and night for urgent admissions regardless of creed and that clergyman of all denominations would have free access to their parishioners [17]. Clergymen were not immune from illness and the Rev A. J. Burt was reported to be improving in December 1986 after a long admission [18], and similarly, Father Deasy was approaching discharge in April 1897 also after a long illness in the Kalgoorlie Hospital [19].

By April 1896, Kalgoorlie Hospital had 56 beds, with proposals for another 34. The risk to hospital staff of catching diseases was demonstrated in April 1896, when both Dr. O'Meehan, the hospital medical officer, and Miss Bessie Way, the matron, contracted typhoid. Clearly the position of matron was not an office job then. Dr. O'Meehan recovered uneventfully and was expected to return to work shortly, while Dr. Barber worked as locum medical officer. Bessie Way was not admitted suggesting a mild attack. She returned to her home in Adelaide by coach to Albany, then steamer to Adelaide, for a month's convalescence accompanied by her mother, who had nursed in her daughter's place and *'moved about in the sick wards like a ministering angel'*

The typhoid epidemic worsened in April. 64 of the 76 patients admitted had typhoid, which caused five of the seven deaths. The Colonial Secretary approved Dr. J Barber's telegram request for another ward, but it was not erected as the outbreak subsided for a while [20,21]. Soon after Bessie Way's return, she became engaged to Mr. Harvey, of Kalgoorlie, which then necessitating her retirement from nursing, and Miss C. H. Bucklay was appointed as matron of the Kalgoorlie Hospital [22,23].

In spite of cooler weather, typhoid caused 96 of the 113 admissions plus four of the six deaths in June 1896, and 18 of the 36 admissions, plus seven of the eight deaths in July in Kalgoorlie Hospital [23,24]. By October, plans for the new hospital were well advanced and Dr. O'Meehan visited Perth for a few days to give an expert medical opinion, then considered important in the construction of a new hospital [25].

Records, currently archived in the Kalgoorlie Hospital, of admissions to the Hospital date from December 1st 1896. This paper reviews the first 298 patients admitted between that date and April 27th 1897, with the last of the being discharged on 3rd September 1897 after 101 days in hospital. The tent hospital had been open at least since late 1895 and some details are available in local papers, the more permanent structure was opened about February 1897, though the date is not clear.

The Permanent Building

Construction of the St. John of God's Hospital building to replace the tent hospital commenced in late 1896, and by January 1897 had progressed sufficiently to anticipate the admission of patients within three weeks. The paper reported *'The front set of rooms, comprising the sisters' quarter's, a reception-room, the kitchen and the scullery, the washhouse, &c., is rapidly approaching the final stage. The sisters' rooms are thoroughly ventilated in the walls and ceilings. They have fire places, and are painted and papered in a. refreshing tint, with a dado of fluted iron, a wooden skirting, and a bordering of wood. The ceiling is of fluted iron also. The building alone will cost about £3,800, and the framing will need an expenditure of between £40 and £500'* [26].

Three miners' deaths in the Kalgoorlie Hospital were reported in February and recorded in the admissions and discharges. One of them Michael O'Grady, was admitted with typhoid on 22/1/1897 and died six day later [27].

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The co-located Mrs. Mecham's Kalgoorlie Private Hospital, was first mentioned when destroyed by fire! The fire broke out in a bush shed an evening in March about 7 o'clock where one of the nurses was lighting a lamp, unfortunately igniting the shed. The fire then advanced too rapidly to prevent its progress. The eighteen patients in the building at the time, all suffering from typhoid, were all evacuated and safely transferred to the Government Hospital. The only significant injury was to the recently arrived police constable Baxter's spine through a fall over a log of wood, and he was also conveyed to the Hospital [28].

The new Kalgoorlie Hospital was visited by the state Premier, who was subsequently farewelled with hearty cheers at the railway station, presumably for his attendance, rather than his departure [29,30]. The Dispensers J. Boilean & Co were awarded the pharmacy position in the new hospital building.

The current Perth based principal medical office, Dr. Lovegrove, paid an official visit to Kalgoorlie hospital in July 1897. Dr Lovegrove supported the hospital doctor in public health issues [31]. In August 1897, Miss Lee, previously matron of the Coolgardie Hospital, became matron of the Kalgoorlie Hospital [32].

Between December 1st, 1896 and April 27th 1897, 195 out of 298 (65%) admissions to Kalgoorlie Hospital had typhoid with 34 deaths (mortality rate 17%). 38% of these cases were miners, and 15 were involved in the preparation or distribution of food and drink, as storekeeper (2), butcher (2), baker (2), house keeper, brewer, hotel servant, cellarman, barman, brewer, housemaid, cordial manufacturer and domestic, and therefore a serious risk factor in the dissemination of the disease. 18 other patients were admitted with the diagnosis of diarrhoea, dysentery and peritonitis, some of whom may also have had typhoid. Two patients with typhoid were suspected of having intestinal perforation, both died. The only nurse admitted to Kalgoorlie hospital in the study period was Emily Herbert, aged 25, with influenza for 12 days followed by uneventful discharge.

Table 1: summary of the documented cases admitted to Kalgoorlie Hospital - December 1896-April 1897.

Month	Total admissions	No with typhoid	Miners with typhoid	Women with typhoid	Food workers with typhoid	Deaths with typhoid
December	30	15	11	1	0	1
January	73	40	17	1	2	6
February	59	36	14	2	4	5
March	63	45	13	2	6	9
April	73	59	20	3	3	13
Totals	**298**	**195**	**75**	**9**	**15**	**34 (17.4%)**

After the initial typhoid epidemics swept the goldfields no subsequent epidemic disease had such a serious impact. Other common infections at the time included influenza, bronchitis, tuberculosis and meningitis, and there were also many admissions with trauma sustained in the mines and elsewhere.

Fresh water and Charles O'Connor

Kalgoorlie finally obtained a fresh water supply, pumped from Perth thanks to the vision and engineering expertise of an Irishman Charles O'Connor. He became Engineer-in-Chief of Western Australia in 1891. He is best known for the construction of Freemantle harbour, but the construction of a pipeline from Mundaring Weir near Perth was a unique feat in engineering at that time. Forrest the premier approved a loan of £2.5 million. 5 million imperial gallons was pumped in eight successive stages through 530 km of 760 mm diameter pipe to Kalgoorlie. Unfortunately O'Connor was criticised in parliament and the media as incompetent and corrupt, resulting in his suicide a month before the pipe commenced sending water to Kalgoorlie. A subsequent inquiry belatedly cleared him of any wrong doing. O'Connor, an expert professional, was politically naive and unaccustomed to the mud-slinging of politicians. Today his vision and skill are recognised and an electorate in Western Australia is named after him [33].

Kalgoorlie Hospital today

Kalgoorlie Hospital, the largest regional public hospital in Western Australia is a 131-bed inpatient facility, with a 24 h Emergency Department servicing over 20,000 patients per year, a coronary care/high dependency unit, a dialysis unit plus medical, surgical, obstetrics and gynaecology, paediatric, mental health, and orthopaedic wards. Sub-specialists in ENT, Urology, Ophthalmology and Oncology visit regularly and the Royal Flying Doctor is available to take complex and critical cases to tertiary hospitals in Perth. Trauma from motor vehicle accidents and mining injuries and alcoholism are common.

Past terminology

Some terms appear in the 'designation' or diagnostic column that are no longer in common usage. Morbus cordis means heart disease, possibly heart failure, but usually used when a more specific diagnosis is not clear; phthisis specifically meaning wasting, but used almost specifically for tuberculosis: cholera nostras is an illness similar to cholera: ptomaine poisoning means food poisoning by a microorganism, simple continuous fever means exactly that, a non-specific term still found in homeopathy texts, and capillary bronchitis is now termed bronchiolitis.

Typhoid in the 21st century

Typhoid, or enteric fever, remains a severe global problem compounded by increasing antibiotic resistance, limited vaccine efficacy and international tourism today with an estimated 22 million cases annually and an estimated 200,000 - 600,000 deaths [34]. In the twenty-first century enteric fever has largely become a disease of the third world where standards of water cleanliness and sanitation are suboptimal. It is found mainly in Asia where an estimated 13 million cases occur annually, with 400 000 deaths, particularly following war or natural disasters where water supplies become polluted. Children have disproportionately increased levels of morbidity and mortality.

Chloramphenicol, Ampicillin, and Co-trimoxazole have been used to treat typhoid since they first became available, however Chloramphenicol resistance had become widespread forty years ago, and resistance to all three has been detected in Asia for over twenty

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years. Flouroquinalones have become the drug of choice. Current vaccines are ineffective against *S. paratyphi*, the predominant tourists' pathogen, and provide only moderate protection against S. Typhi [4].

In first world counties, typhoid has become a disease of young unvaccinated tourists to Asia. Improvements in sanitation and hygiene between 1920 and 1990 reduced the annual number of cases in USA from about 36.000 to approximately 500. The proportion acquired during foreign travel over the thirty years between 1967 and 1997 has increased from 33% to 81% [4].

Lynch reported 1902 typhoid fever cases, median age 22 years, detected in USA between 1999 and 2006, 1295 (73%) required hospitalization and 3 (0.2%) died. 1439 (79%) reported foreign travel in the previous 30 days of illness, only 58 travellers (5%) had been vaccinated against typhoid. 272 (13%) of 2016 isolates tested were resistant to ampicillin, chloramphenicol, and co-trimoxazole (multidrug-resistant S Typhi) [35].

Enteric fever still occurs in Australasia. Auckland Hospital reported 162 confirmed cases in a six year period, 50% having travelled beyond the Pacific area, 25% had travelled within the Pacific and 25% had not left New Zealand. 83% were *Salmonella typhi*. Fever and diaphoresis were reported by 91% of patients, but only 61% had diarrhoea. Ciprofloxacin and amoxicillin were the most commonly prescribed antibiotics. The median length of stay was six days compared with 50 days a hundred years ago and there were no deaths compared with 17% in the gold rush days of Kalgoorlie. However 28% of the New Zealand cases had a recent previous admission to hospital with probable typhoid when the correct diagnosis was not made, probably a higher figure than in early Kalgoorlie where familiarity would generate a higher level of suspicion.

Conclusion

Enteric fever caused most of the admissions and deaths in the Kalgoorlie hospital in the early days of the gold rush 120 years ago. In spite of the advances since then, the disease remains a very common cause of essentially preventable morbidity and mortality in a world where first world greed and labels appear more important than providing a safe supply of water in the third world. The third world needs a Charles O'Connor! The problem will be increasingly exacerbated by progressive antibiotic resistance and the limited efficacy of current vaccines unless we act soon to ensure safe water all over the world.

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