doi:10.3233/SHTI200485

200 Years Since the Birth of Nursing Informatics?

Helen J. BETTS ^a and Graham WRIGHT ^{a,b,1} ^a Centre for Health Informatics Research and Development (CHIRAD), Port Elizabeth, South Africa ^b Department of Information Systems, Rhodes University, Grahamstown, South Africa

Abstract. It is 200 years since the birth of Florence Nightingale. This keynote paper reviews some of her work relating to health statistics and outlines its continuing legacy to nursing informatics around the world and especially in poorer countries, like South Africa, in the 21st century.

Keywords. Florence Nightingale, Uniform Classification, Hospital Statistical Form, Mortality

1. Introduction

Florence Nightingale was born in Florence, Italy, on 12 May 1820, and grew up at Embley, East Wellow, England, the family home, with her older sister, Parthenope, where they were initially educated by a governess (1,2). Then their father continued their home education himself because he believed that women should be educated. Nightingale thrived in her studies. Statistics became a tool that she used in many of the reports she wrote post the Crimean War. Some scholars regard Nightingale as a great statistician, rather than the founder of modern nursing (3,4).

2. 1820: the early years

The sisters were educated for a life in society. Embley provided the perfect setting for Mrs Nightingale to entertain some of England's foremost personalities including Charles Babbage, who originated the concept of a digital programmable computer and was the founder of the London Statistical Society. Nightingale records in 1867 (1,2) that God called her to His service on 7 February 1837, aged 16 years, at Embley, but she did not know what she was to do. Her life at home was miserable; her sister repeatedly reproached her, and she disliked the dull routine of Victorian home life. In December 1845, Nightingale asked her parents if she might go to Salisbury Infirmary for three months to observe. An argument followed. Her mother was worried about the offensive language Nightingale might hear in a hospital and the embarrassment she would bring on her family (2,5). Her father went to London to get away from the tension and spoke

¹ Corresponding Author, Professor Graham Wright, Department of Information Systems, Rhodes University, Grahamstown, South Africa; Profwright@gmail.com.

to friends about hospital nursing. Most held the established opinion that a gentlewoman could find herself in "unpleasant surroundings" should she become a nurse (1).

3. 1837: Her Craving to Work

Nightingale only enjoyed domestic responsibilities was when she was asked to give someone nursing care or there was a need for a temporary housekeeper. In January 1837 there was an outbreak of influenza and Nightingale, her cousin and the cook did not catch it. Nightingale spent the month acting as "nurse, governess, assistant curate and doctor while continuing with her studies" (6) and admitted in a letter to Parthenope "At all events, I have killed no patients, though I have cured few" (6). Parthenope was unwell and she and her mother planned to visit Carlsbad in the summer of 1851. Nightingale demanded to go with her mother and sister to spend time at Kaiserswerth, Germany. Pastor Theodor Fliedner had founded an order of deaconesses where spinsters could work within the confines of a religious community. Nightingale arrived in early July and stayed three months. The routine at Kaiserswerth was strict but she returned home feeling more peaceful, although still resolved to take control of her life and follow her own path. In April 1853 Nightingale became the Superintendent at the Institution for the Care of Sick Gentlewomen in Distressed Circumstances in London. Her father's one positive move was to give Nightingale a generous £500 a year allowance, equal to approximately 75,000 euros today. The following year the British were at war in the Crimea and the war correspondent William Howard Russell sent news back of the fighting there in October 1854. On 21 October Nightingale and a group of nurses set sail for Constantinople. Nightingale was mentally burdened by her experiences in Scutari and began to statistically analyse the causes and rates of death of the soldiers with the help of Dr William Farr. The Government attributed the huge death rate to malnourishment and hypothermia on the front line. Small (7) undertook an in-depth exploration, including formerly unused letters, of "Nightingale's own claim that while she was Superintendent of Nursing in the hospitals of the Crimea War 14,000 soldiers died in hospital because she and the medical staff neglected elementary sanitary precautions" (7). Nightingale and Farr showed that it was the unhygienic hospital conditions, particularly overcrowding, that precipitated the soldiers' deaths. Small confirmed that the Army's neglect of the soldiers in the trenches was not the cause "as everyone believed. It had been primarily caused by bad hygiene. The worst of these, where 5,000 men died in the winter of 1854/5, was Florence Nightingale's own base hospital at Scutari" (7), in Constantinople. Cook (1) stated that Nightingale recognised that the majority of soldiers need not have died. She devised the coxcomb, a statistical figure, to illustrate the causes and rates of death during the war, where the statistic being represented is proportional to the area of a wedge in a circular diagram (8,9). Small reasoned that Nightingale's logical thought processes brought her to the conclusion that her inexperience and pride had led to the death of thousands of soldiers and that the remainder of her life was focussed on trying to redress her guilty feelings.

4. 1858: Collaboration with Dr. Farr on Uniform Classification and Model Forms

Dr. William Farr was a prominent epidemiologist who was appointed in 1838 to the General Register Office of England and Wales. In his first Annual Report Farr strongly

recommended the implementation of a uniform classification. The tenet of organising diseases by anatomical site as suggested by Farr, was the foundation of the International List of Causes of Death. His nomenclature and classification of disease, endures as the foundation for the International Classification of Diseases, now in its 11th revision (10). As a fellow member of the Statistical Society Farr knew Nightingale and worked with her on several statistical projects. In 1859 she was examining hospital statistics in London and found that each hospital used its own nomenclature and classification of diseases and there was no consistent methodology for data collection. Several willing hospital doctors and Farr assisted her to prepare a standard list of diseases and a model Hospital Statistical Form was designed. The forms were printed in 1859 and four London hospitals agreed to use them. Nightingale and Farr studied the results which showed that a large field of statistical analysis would be available if all hospitals adopted the forms. On 21 June 1861 at a meeting at Guy's Hospital it was agreed that the Metropolitan Hospitals should implement a standardised system of Registration of Patients, that each hospital should publish its statistics annually and that Nightingale's Model Forms be embraced as much as possible. Cook suggested that the scheme was abandoned because the data collection and checking was laborious and costly to ensure it was uniform and accurate. This then impinged on the validity of the conclusions drawn from the statistical analysis (1). Undeterred and with the help of Farr and Sir James Paget from St Bartholomew's Hospital, Nightingale then created forms for collecting surgical patient data. The Royal College of Surgeons studied the results but reported negatively (1,11). No information is given for the reason for the negative report and this lack of evidence suggests that the surgical Hospital Model Forms also fell into disuse.

5. 1871: Notes on Lying-in Institutions

Nightingale wrote Notes on Lying-in Institutions in 1871 (12). She collected English and European statistics on maternal mortality. It began with a brief preface on the rise in maternal deaths at the Kings College Hospital Midwifery School, which started in 1862. It closed five years later because nine women had died that year following 125 deliveries. Later in the treatise (12) Nightingale turned her attention to deaths in lying-in institutions. She maintained that puerperal fever was the primary cause of death across Europe and that lying-in hospitals and lying-in wards in general hospitals should be closed.

Maternal mortality is still excessively high. About 295,000 women died during and following pregnancy and childbirth in 2017 (13). 86% occurred in Sub-Saharan Africa and Southern Asia. As with women in 19th century Europe, poorer women have, on average, many more pregnancies than more wealthy women and hence their risk of death is higher. Puerperal sepsis, haemorrhage and toxaemia (eclampsia) still feature at the top of the list of causes of death. The key reasons which prevent women from obtaining health care are: poverty, distance to facilities, lack of information, inadequate and poor quality services and cultural beliefs and practices. This leads one to reflect that some poorer countries of the world have not developed beyond the level of 19th century Europe.

6. Nightingale's Legacy to the Poorer Countries of the World

The majority of the African continent is rated by the world bank as low income countries, with a few rated as middle income. Africa's 54 countries have several large cities that can be compared to large cities around the world but the majority of the people living in the rural areas have a very different view of the world. It is reasonable to compare major South African cities to European cities that have every technological convenience, for example; Durban, Pretoria, Johannesburg, Cape Town and Port Elizabeth. However, South Africa also has 27% of its population unemployed and low paid workers living on less the 150 euros a month. The larger part of South Africa and indeed Africa as a continent, is similar to Europe in the 19th century. "Around 640 million people currently live without electricity in Africa – 210 millions of which are in fragile and conflictaffected countries" (14). Technology is hard to sell where there is no electricity and the majority of people still cook on open fires. In South Africa the current poor doctor patient ratios and the difficulties of attracting doctors to rural areas, means nurses are providing most Primary Health Care (PHC) services in some 4,000 nurse-led clinics predominately in rural areas together with a growing number of mobile clinics. Their role includes the collection of data to support programmes of care often in conjunction with the Centre for Disease Control, CDC Africa. Many African countries use paper-based recording systems to collect data handwritten in registers, similar to Nightingale's Model Hospital Forms, to support the administrative purposes of public health programmes. Programmes of care have defined clinical guidelines which require nurses to record the patient's visit in one of many registers. Each programme of care has its own register, for example for HIV, Diabetes, Asthma, Hypertension, Tuberculosis (TB) and Antenatal care. Difficulty occurs when a patient has more than one disease, for example Tuberculosis and HIV, into which register should the patient be entered? For registers to be of any value, they should be written contemporaneously, however in the rural clinics the volume of patients waiting to be seen negates this possibility. Registers are often written up at the end of the day or week and therefore the accuracy of the data is suspect. This data is then hand aggregated for submission to the District Health Information System (DHIS) in the form of ICD codes.

7. Conclusions

"Nursing Informatics science and practice integrates nursing, its information and knowledge and their management with information and communication technologies to promote the health of people, families and communities world-wide." (15). This is the definition that the IMIA Nursing Special Interest Group asks that members of the IMIA family use. It links the need for information management to support the health of people. It includes information processing and communication technologies but does not specify any particular technology. The management of information by nurses for the advancement of healthcare is pivotal to a 21st century definition of nursing informatics. The tools and technologies that are used are secondary. Nightingale, today would probably use a laptop, smart phone or tablet computer and be an expert spreadsheet guru with varying scenarios that forecast death rates and mortality, depending on the validity of the data collected. She would still be influential with national and international decision makers concerning the inequalities still to be addressed in the world.

Nightingale's unique contributions to nursing administration and management confirmed her as a pioneer nursing informatician. Her broad education prepared her to research meticulously, document in detail and think creatively. She was a thorough researcher and her data led approach, with illustrations, so that others might understand, indicated her drive to improve care. Nightingale would approve of IMIA's definition of Nursing Informatics because its purpose is "to promote the health of people, families and communities world-wide" (15) which is the critical component of the duties of 21st century nurses in their care of the sick around the world. Nightingale died peacefully 13 August 2010 and would be delighted in the way that healthcare, especially nursing, has developed over the past 200 years. Her statistical work has influenced health care management including the development of world health monitoring of diseases and epidemiology. However, she would be saddened that the world still has a long way to go to reach health equality for all to a 21st century standard.

References

- [1] Cook E. The life of Florence Nightingale. Vol. 1: 1820-1861. 1913.
- [2] Woodham-Smith C. Florence Nightingale, 1820-1910. 1950.
- [3] Nuttall P. The passionate statistician (Florence Nightingale). 1983.
- [4] Kopf EW. Florence nightingale as statistician. Q Publ Am Stat Assoc. 1916;15(116):388-404.
- [5] Baly M. Nursing and social change. 1995.
- [6] Bostridge M. Florence Nightingale: the woman and her legend. 2008.
- [7] Small H. Florence Nightingale : avenging angel. St. Martin's Press; 1998. 221 p.
- [8] Betts H, Wright G. Lessons on Evidence-based Practice from Florence Nightingale. In: Nursing and informatics for the 21st century: an international look at practice, trends and the future. 2006.
- [9] Cohen IB. Florence Nightingale. Sci Am. 1984;250(3):128–37.
- [10] WHO. WHO Classifications ICD10Volume2. 2010.
- [11] Bishop WJ, Goldie S. A bio-bibliography of Florence Nightingale. Dawsons of Pall Mall for the International Council of Nurses; 1962.
- [12] Nightingale F. Introductory Notes on Lying-In Institutions. Together with a proposal for organising an institution for training midwives and midwifery nurses. 1871.
- [13] WHO, UNICEF, UNFPA, The A, World Bank. TRENDS IN MATERNAL MORTALITY : 2000 TO 2017 estimated by World Health Organization. 2019.
- [14] World Bank. Africa Overview. 2020.
- [15] International Medical Informatics Association Nursing Informatics (IMIA-NI). IMIA-NI definition of nursing informatics updated. https://imianews.wordpress.com/2009/08/24/imia-ni-definition-of-nursinginformatics-updated/; 2009.