Oxford Dictionary of National Biography

Snow, John (1813–1858), *anaesthetist and epidemiologist*
by Stephanie J. Snow

Snow, John (1813–1858), anaesthetist and epidemiologist, was born on 15 March 1813 at North Street, York, the eldest of the nine children of William Snow (1783–1846) and his wife, Frances Askham (1789–1860). At the time of Snow's birth his father was a labourer, but he later became a farmer and in 1841 moved to a farm in Rawcliffe, outside York. Snow's early education included the learning of Latin, and at fourteen he was apprenticed to William Hardcastle, a surgeon apothecary in Newcastle upon Tyne. In 1831 Hardcastle was appointed to attend the poor during the cholera epidemic of 1831–2, and Snow treated the miners at Killingworth colliery. It was his first encounter with the disease that was to occupy much of his professional life. Snow attended sessions at the Newcastle school of medicine in 1832–3, and on completing his apprenticeship he became assistant, first to Mr Watson, general practitioner in Burnopfield, and then to Joseph Warburton, general practitioner in Pateley Bridge. Snow had become a vegetarian during his apprenticeship after reading several scientific works on the subject. In 1836 he joined the York Temperance Society, and in 1845 he became secretary of the Medical Temperance Society, which was established by a group of London doctors including Richard Hicks. However, when his health began to deteriorate both he and his friends attributed his illnesses to his diet and he returned to eating animal products and drinking wine in the mid-1840s.

In October 1836 Snow enrolled at the Great Windmill Street school of medicine in London, and he shared lodgings at 11 Bateman's Buildings, Soho Square, with a fellow medical student, Joshua Parsons. Six months' surgical practice at Westminster Hospital completed Snow's training and he became a member of the Royal College of Surgeons in May 1838 and a licentiate of the Society of Apothecaries in the following October. He had applied for the post of apothecary to the Westminster Hospital in July 1838 but failed to obtain it, as the by-laws of the hospital stated it could be held only by a member of the Society of Apothecaries; Snow had been prevented from sitting the examination in July rather than in October, because the society refused to recognize the twelve months' hospital practice he had undertaken in Newcastle. In September 1838 Snow moved to 54 Frith Street, Soho, and set up in practice, while also working in the out-patient department of Charing Cross Hospital and as a medical officer at several sick clubs. In 1845 he became a lecturer in forensic medicine at the Aldersgate school of medicine, though his appointment was short-lived as the school closed in 1848. He kept busy with sick-club and dispensary work, but his private practice did not become well-established until the late 1840s and the arrival of anaesthesia. Snow

continued his progress up the hierarchy of medical qualifications by gaining his MB (1843) and MD (1844) from the University of London, and he became a member of the Royal College of Physicians in 1850.

Snow believed he owed his successful practice in London and his medical achievements to his early connection with the Westminster Medical Society, which merged with the Medical Society of London in 1851. He had joined the society in 1837 while still a student and he became its orator in 1853 and its president in 1855. He was also a member of the Medico-Chirurgical Society and held committee posts at both societies from 1844 onwards. He was one of the first members of the Epidemiological Society, founded in 1850, and he served on its council with other notable individuals such as Thomas Addison, Richard Bright, Benjamin Brodie, and Charles Hastings. He was a vigorous debater at society meetings; as early as 1838 he challenged the views of Edward Lonsdale, anatomy demonstrator at the Middlesex Hospital, on the anatomy of the recti muscles. He contributed regularly to medical journals and of particular relevance to his later work on anaesthesia are 'On the effects of carbonic acid', (1839) and 'On asphyxia and the resuscitation of newborn children', (1841), both published in the *London Medical Gazette*. He devised several new instruments, including a pump that could be used for artificial respiration, in 1841, and a trocar and cannula for removing fluid from the chest while avoiding the entry of air, so preventing the collapse of the lung, in 1844.

Among Snow's closest medical friends were Sir Benjamin Ward Richardson, who wrote the first memoir (J. Snow, *On Chloroform*, 'Memoir'); Edwin Lankester, who supported him during the investigation into the cholera outbreak in Broad Street in 1854; and John French, medical officer to Poland Street workhouse from 1830 to 1872. He was also particularly attached to Charles Empson, his mother's brother. Empson, a fine-art dealer, lived in Newcastle during Snow's apprenticeship years and then moved to Bath, where Snow visited him in 1836 while travelling from York to London on foot. Empson also accompanied Snow to Paris in 1856. There Snow (unsuccessfully) entered a copy of his treatise on cholera in a competition at the Medical Institute and was introduced to Emperor Napoleon III.

Snow witnessed the use of ether only nine days after James Robinson had first used it in Britain, for a tooth extraction on 19 December 1846. By mid-January 1847 Snow had used his knowledge of chemistry to research the scientific principles of the inhalation process and the effects of the inhalation of ether on the body's physiological responses. He recognized that an efficient inhaler, which allowed the control of vapour strength, was fundamental to the safe administration of any anaesthetic agent and he went on to develop several instruments. Once he had established the principles of ether administration he lost no time in gaining practical experience. By early February 1847 he had administered ether at St

George's Hospital, London, for eight surgical operations. This marked the start of a successful career as an anaesthetist and he quickly developed a specialist practice working in many London hospitals and with some of the most eminent surgeons of the period, including Robert Liston, William Fergusson, and Caesar Hawkins.

In August 1847 Snow produced his definitive ether inhaler and in October he published *On the Inhalation of the Vapour of Ether in Surgical Operations* (1847). This short work was greeted favourably by reviewers and encouraged him to write a series of eighteen papers in the *London Medical Gazette* between 1848 and 1851 which described experiments with a wide range of anaesthetic agents. One of his most important legacies to anaesthetics was his description of the five identifiable stages of the anaesthetic process. His intention was to provide doctors with the ability to interpret the patient's physiological signs and to adjust the administration of vapour accordingly.

In November 1847 James Young Simpson publicized the use of chloroform, and within a week Snow had carried out experiments on animals, prepared a table on the quantity of chloroform that air would hold at different temperatures, and had himself inhaled the substance. He adopted the use of chloroform without hesitation, though he always held that ether was the safer agent, and he spent much time researching a whole range of possible anaesthetic agents with a view to finding one which combined the efficacy of chloroform with the safety of ether. His experimental research into anaesthesia established administration techniques, technical apparatus, and the overall margins of risk within the procedure. These remained as the first foundations of the specialism. Snow's reputation for safety and skill led to the successful administration of chloroform to Queen Victoria during the births of Prince Leopold (1853) and Princess Beatrice (1857). Given the debate which surrounded the safety of chloroform, and its justification in childbirth, Snow's attendance presented no small professional risk.

Snow's contribution to the establishment of the specialty of epidemiology is also well-recognized, and he is remembered primarily in this context for the discovery that cholera was a waterborne infection. *On the Mode of Communication of Cholera*, which described his theory, received little acclaim from the medical world when it was published in 1849. The second edition (1855) contained statistical evidence which he had compiled from the 1854 outbreak of cholera in Broad Street, London, and from his investigations into the supply of water to south London by the water companies of Southwark and Vauxhall, and of Lambeth. The Broad Street cholera outbreak began on 31 August and claimed over 500 lives in ten days. At its start Snow began to consider the local water supplies, and he suspected contamination of the water pump in Broad Street. He took a list of deaths from cholera from the General Register Office and mapped the location of these deaths

around the locality. His analysis showed that the majority of deaths had taken place in the vicinity of the Broad Street pump and he presented this evidence to the local board of guardians. The handle of the Broad Street pump was removed, but although this incident has been recorded as the dramatic halt of the outbreak this was not the case, as the intensity of the epidemic was already receding. What is important about the event is that Snow's evidence succeeded in forcing local government action. A cholera inquiry committee was eventually set up by the parish to investigate the outbreak further, and with the help of Edwin Lankester and Henry Whitehead, the local curate, the original source of contamination of the water pump at the commencement of the outbreak was identified.

Snow's interest in water supplies to south London stemmed from the 1849 epidemic, when he noted that cholera fatality rates were particularly high in the areas supplied by the Lambeth and the Southwark and Vauxhall water companies. In 1852 the Lambeth company moved its waterworks to Thames Ditton, thus obtaining a supply of water quite free from the sewage of London. Snow undertook an investigation to calculate the number of deaths from cholera per 10,000 houses during the first seven weeks of the 1854 epidemic. He recognized the scope presented by such an epidemiological experiment, as it would include 300,000 individuals of both sexes, of varying ages and occupations, and from all social classes. His initial conclusions found that 38 houses out of the 44 where deaths from cholera had occurred were supplied with water by the Southwark and Vauxhall water company and he communicated these facts to William Farr. Farr ordered his registrars of all south districts of London to make a return of the water supply for all houses where there had been a death from cholera. The conclusion of this investigation was that the mortality rate for the houses supplied by the Southwark and Vauxhall company was between eight and nine times greater than houses supplied by the Lambeth company. This investigation was an excellent demonstration of collaborative working between practitioners in medicine and those in the newly emerging social sciences. Snow was unable to obtain the proof he required through traditional medical science, so he turned to the new public health data sources to provide evidence for his argument.

Snow contended that his two investigations completely substantiated his theory, but this was not the view of the medical world at large. Reviewers conceded the importance and quality of his work, but could not accept that, in most cases, infected water was a primary source of the disease. It was only in the twentieth century that the accuracy of Snow's theory, and the quality of his epidemiological investigations, became widely appreciated. His writings on other public health issues, such as the adulteration of food, demonstrate his belief that epidemiology had a vital role to play in raising the quality of human life.

Snow's health had been poor since the 1840s and on 10 June 1858, while completing *On Chloroform and other Anaesthetics* (1858), he suffered a stroke. His condition deteriorated and he died (unmarried) on 16 June that year, at his home at 18 Sackville Street, Piccadilly, London, where he had lived since 1852. His brother, William, was present at his death. Post-mortem examination showed evidence of old pulmonary tuberculosis and advanced renal disease. Snow was buried in Brompton cemetery, London, on 21 June 1858.

STEPHANIE J. SNOW

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