Glasgow Coma Scale

50th anniversary

Thursday 27th June 2024

Royal College of Physicians and Surgeons
233-242 St Vincent Street, Glasgow, G2 5RJ

ROYAL COLLEGE OF
PHYSICIANS AND
SURGEONS OF GLASGOW

Introduction

The year 2024 marks the 50th anniversary of the Glasgow Coma Scale. The introduction of the scale, known universally as the GCS, was a major medical milestone, with a genuine global impact, representing a paradigm shift in the evaluation of the unconscious patient.

In their landmark paper published in the Lancet in 1974 *'Assessment of coma and impaired consciousness. A practical scale'*, neurosurgeons Graham Teasdale and Bryan Jennett described a new approach to the assessment of consciousness, a pragmatic scale based on 3 domains; eye opening, verbal performance, and motor response. Before the GCS, there was no consistent, reliable and universally accepted way to evaluate the patient in coma. Once the scale was introduced, it allowed health professionals to record consciousness in a concise and objective fashion, and to communicate with each other in a way that is universally understood. The genius of the GCS lies in its simplicity, reliability and effectiveness. The GCS remains highly relevant today and continues to be used throughout the world.

The GCS put the Institute of Neurological Sciences and Glasgow on the map, and we wish to celebrate this historic achievement. Today's programme is an academic celebration of the Glasgow Coma Scale, featuring GCS-themed presentations from a panel of respected speakers. While there is some retrospection, this brings out the factors that contributed to the success of scale. However, the state of the art, and more importantly, the future of the GCS, particularly in the global context, are front and centre. We hope that you enjoy this historic occasion.

Chris Barrett

GCS 50 organiser

Consultant Neurosurgeon, Institute of Neurological Sciences, Glasgow

I. Academic programme

Thursday 27th June 2024

10.00 – 10.30	**Registration and refreshments**
10.30 – 10.35	**Welcome** Mr Chris Barrett, Consultant Neurosurgeon, INS, Glasgow, UK
10.35 – 10.55	**In the beginning.....** Sir Graham Teasdale**,** Emeritus Professor of Neurosurgery, Glasgow, UK
Session 1: The impact of the GCS Chair: Professor John Pickard, Past President SBNS	
10.55 – 11.25	**50 years of the GCS in Neurotrauma** Professor Andrew Maas, Emeritus Professor of Neurosurgery, Antwerp, Belgium
11.25 – 11.50	**GCS in subarachnoid and intracerebral haemorrhage** Professor David Mendelow, Emeritus Professor of Neurosurgery, Newcastle, UK
11.50 – 12.15	**The GCS in practice - a nursing perspective** Professor Mary Braine, University of Salford, Salford, UK
12.15 – 12.40	**The GCS - a 50 year bibliometric retrospective** Dr Tobias Mattei, Attending Neurosurgeon, St Louis, Missouri, USA
12.40 – 13.00	**Question and answer session**
13.00 – 13.40	**Lunch and exhibition**
Session 2: The state of the art Chair: Professor Peter Whitfield, President SBNS	
13.40 – 14.05	**The classification of traumatic brain injury** Professor Mark Wilson, Imperial College, London, UK
14.05 – 14.30	**Assessing responsiveness in brain injury** Professor David Menon, Professor of Neuroanaesthesia, Cambridge, UK
14.30 – 14.55	**Can GCS predict rehabilitation outcomes?** Dr Tengcheng Khoo, Consultant in Neurorehabilitation, Glasgow, UK
14.55 – 15.20	**50 years and still innovating : GCS-P and beyond** Mr Paul Brennan, Reader in Neurosurgery, University of Edinburgh, UK
15.20 – 15.35	**Question and answer session**
15.35 – 15.50	**Refreshments and exhibition**
Session 3: The GCS in a Global context	

Chair: Mr Nigel Mendoza, Chair SBNS Global Neurosurgery Initiative	
15.50 – 16.15	**Rescuing the injured brain - traumatic brain injury in the global context** Professor Peter Hutchinson, Professor of Neurosurgery, Cambridge, UK
16.15 – 16.40	**GCS 'Global'** Mr Paul Brennan, Reader in Neurosurgery, University of Edinburgh, UK
16.40 – 17.00	**Discussion: the future of the GCS** Moderated discussion
17.00 – 17.15	**Closing remarks** Mr Mike McKirdy, President, Royal College of Physicians and Surgeons, Glasgow

II. The GCS authors

Sir Graham Teasdale graduated from Durham University Medical School in Newcastle upon Tyne in 1963. Experienced in neurology, he gained the MRCP in London in 1966, before becoming FRCSEd in 1970. He trained in neurosurgery at the Institute of Neurological Sciences, Glasgow, where he was appointed Consultant and Senior Lecturer in neurosurgery in 1974. That same year, with Bryan Jennett, he published the landmark paper *"Assessment of Coma and Impaired Consciousness: a practical scale",* which first described the Glasgow Coma Scale. When Bryan Jennett became Dean of Medicine, Graham Teasdale succeeded him as Professor and Head of the University Department of Neurosurgery, a role he held from 1981 to 2003.

Professor Teasdale was founder and first President of the European Brain Injury Consortium, from 1993 to 2002, and also held the position of President of the International Neurotrauma Society from 1994 to 1998. He then served as President of the Society of British Neurological Surgeons from 2000 to 2002 and received the Society's medal.

In 2003, he began his term as President of the Royal College of Physicians and Surgeons of Glasgow (RCPSG), a position he held until 2006. During this time, he also chaired the Senate of Surgery of Great Britain and Ireland from 2003 to 2005. Following his presidency, he chaired the Board of NHS Quality Improvement Scotland from 2006 to 2010.

Throughout his career, his research interests spanned various aspects of assessment, prognosis, and management of acute brain damage resulting from head injury and stroke, contributing significantly to the field with over 300 peer-reviewed publications.

He has received numerous honours and awards, including the Patey Prize from the Surgical Research Society in 1980, and fellowships of the Academy of Medical Sciences in 1999, the Royal Society of Edinburgh in 2001, and the American College of Surgeons as an Honorary International Fellow in 2002. He was also a Fellow of RCPSG, the Royal College of Surgeons of England, the Royal College of Surgeons in Ireland, the Royal College of Physicians of London, the American College of Physicians, the Royal Australasian College of Physicians, and the Royal College of Physicians of Ireland.

In 1995, he was honoured as "Scot of the Year" in Science and Medicine. In 2005, he received the Medal of Honour from the World Federation of Neurosurgical Societies. He was awarded an honorary Doctor of Science from Sunderland University in 2013, and he was the first non-American to receive the Distinguished Service Award from the American Association of Neurosurgeons in 2014. His significant contributions to neurosurgery and the treatment of head injuries were recognized with a Knight Bachelor in the 2006 New Year Honours.

Bryan Jennett CBE (1926 - 2008) was born on 1 March 1926 in Twickenham. He graduated top of his class in Liverpool Medical School in 1949. He married his classmate Sheila Mary Pope in 1950, who later had a distinguished career as a professor and respiratory physiologist.

Jennett's interest in head injuries began during his neurosurgical training as a house surgeon to Sir Hugh Cairns in Oxford and as a surgical specialist at the Royal Army Medical Corps hospital in Wheatley. He held training posts in Cardiff and Manchester, gained the Fellowship of the Royal College of Surgeons of England in 1952, and received an MD from the University of Liverpool in 1960 for his work on experimental brain compression.

In 1963, Jennett was appointed to a combined NHS and University Consultant Neurosurgical post in the West of Scotland Unit at Killearn Hospital. He became the first holder of the Chair of Neurosurgery at the University of Glasgow in 1967. He thrived in the multidisciplinary environment of the Institute of Neurological Sciences and the University. He co-directed the Medical Research Council's Cerebral Circulation Research Group with A. Murray Harper, advancing neuroanaesthesia and the treatment of acute brain damage.

In the 1970s, Jennett focused on assembling information to inform the prognosis of severe brain injury, addressing social, ethical, and philosophical issues in the care of severely brain-damaged people. In 1972, with American neurologist Fred Plum, he described the 'persistent vegetative state' in *The Lancet*, the Glasgow Coma Scale with Graham Teasdale, and the Glasgow Outcome Scale with Michael Bond. The department in Glasgow became a centre for training neurosurgeons from around the world, promoting an academic approach to neurosurgery.

Jennett authored nearly 300 papers and several influential books, including "Epilepsy after Head Injuries," "Introduction to Neurosurgery," "Management of Head Injuries" with Graham Teasdale "High Technology Medicine: Benefits and Burdens," and "The Vegetative State—Medical Facts, Ethical and Legal Dilemmas." He defended the concept of brain death during public controversy in 1980, ensuring the continuation and growth of organ transplantation. As Dean of Medicine at Glasgow University (1981-1986), Jennett's interests expanded to include the appropriate use of high-cost technology and clinical practice consensus conferences.

He held numerous leadership roles, including presidency of the neurology section of the Royal Society of Medicine, the International Society for Technology Assessment in Health Care, and Headway, the national head injury patients' group. He was appointed CBE in 1991 and received an honorary DSc from St Andrews University in 1993. In 2007, he was awarded the Medal of the Society of British Neurological Surgeons.

III. Programme sessions

Session 1: The impact of the GCS

Chair

John Pickard CBE FMedSci is Emeritus Professor of Neurosurgery, University of Cambridge After Cambridge and London, he moved to Glasgow to train in Neurosurgery (1972-79) including a fellowship in Philadelphia. After 11 years in Southampton (latterly Professor of Clinical Neurological Sciences), he became the first Professor of Neurosurgery in Cambridge and Chairman of the Wolfson Brain Imaging Centre, the first worldwide to incorporate state of the art imaging (high field MR, PET and multimodality bedside monitoring) within the neurosciences critical care unit. His research has focused on advancing the care of patients with CSF and pituitary disorders, acute brain injury and prolonged disorders of consciousness. He has recently retired from the Honorary Directorship of the NIHR Brain Injury MedTech Cooperative (2013-2020).

Speakers

'50 years of the GCS in Neurotrauma'

Andrew Maas is Emeritus Professor of Neurosurgery at the Antwerp University Hospital and University of Antwerp. He is an Advisory Board member to Wings for Life, and holds positions as past Chairman of the Neurotraumatology Committee of the World Federation of Neurosurgical Societies (WFNS), the International Neurotrauma Society, and the European Brain Injury Consortium. As a young student he was already involved in the development and implementation of the GCS. He received a Lifetime Achievement Award from the International Brain Injury Association (2016), and an Honorary Doctorate at the Burdenko Institute Moscow (2013).

Dr Maas was the Principal Investigator of the IMPACT study group (International Mission on Prognosis and Clinical Trial design in TBI), that was awarded an NIH grant (2003-2011). Together with Prof David Menon, University of Cambridge, he coordinated the large scale collaborative project CENTER-TBI: Collaborative European NeuroTrauma Effectiveness Research in TBI (www.center-tbi.eu), supported by the FP7 program of the European Union (Grant no: 602150; duration: 2013-2021), which has yielded over 300 publications to date.

'GCS in subarachnoid and intracerebral haemorrhage'

David Mendelow is Emeritus Professor of Neurosurgery at the Royal Victoria Infirmary and Newcastle University. He was Senior Lecturer in Neurosurgery in Glasgow from 1980 to 1986 before his appointment in Newcastle. He was made an honorary member of the Neurotrauma Committee

of the World Federation of Neurosurgical Societies (WFNS). He is also Honorary President of the Euroacademia Multidisciplinaria Neurotraumatologica. In these roles he has worked with the World Health Organisation Topic Advisory Group in Neurology to develop the International Classification of Diseases 11th Edition (ICD 11). This includes the Glasgow Coma Scale and Pupillary reactions (GCS-P), which can now be used for coding of all cases of Traumatic Brain Injury, Subarachnoid Haemorrhage and Intracerebral Haemorrhage. He has promoted Clinical Trials in these 3 Disorders throughout his career.

'The GCS in practice - a nursing perspective'

Mary E. Braine is a Senior Lecturer in the School of Health and Society, University of Salford. Her job includes teaching pre-registration nursing students and post-qualification healthcare professionals. She runs the neuroscience nursing post-qualifying course and is a key member of the MSc Advanced Clinical Practice programme teaching team. She trained as a nurse at University College Hospital, London and following her nurse registration initially worked in orthopaedic/trauma care before undertaking specialist training in neuroscience nursing and her neuroscience nursing experience extends over 30 years. Her research interests include brain injury with a special interest in the impact of brain injury on the patient's family, the focus of her doctorate thesis.

She contributes to the support and develop of learning within the speciality of neuroscience nursing by writing scholarly articles, several book chapters and joint authorship of the book "Supporting Families and Carers: A nursing perspective".

She chaired the National Neuroscience Nursing Benchmarking Group (NNBG), for many years and was elected as President of the British Association of Neurosciences Nurses (BANN) in 2019 and is on the editorial board for the British Journal of Neuroscience Nursing.

'The GCS - a 50 year bibliometric retrospective'

Tobias Mattei After graduating *cum laude* from Sao Paulo University Medical School, Dr. Tobias Mattei completed his neurosurgery residency in Brazil. He then moved to the U.S. where he completed a fellowship in Scoliosis Surgery at the University of Illinois at Peoria and another fellowship in Complex & Oncological Spine Surgery at the Ohio State University. He is currently Assistant Professor and Chief of Spine Surgery at St. Louis University. He has published more than 150 peer-reviewed articles and currently serves as deputy editor of the North American Spine Society Journal. He recently published an article with Sir Graham Teasdale in the journal, World Neurosurgery: *'The Message of the Glasgow Coma Scale: A Comprehensive Bibliometric Analysis and Systematic Review of Clinical Practice Guidelines Spanning the Past 50 years.'*

Session 2: The state of the art

Chair

Peter Whitfield is current President of the Society of British Neurological Surgeons, and an Honorary Professor and Consultant in Neurological Surgery at the South West Neurosurgery Department, Plymouth. Peter's first neurosurgical post was at the INS, Glasgow in 1989/90 when he worked as an SHO for Professor Sir Graham Teasdale, Ross Bullock, Ken Lindsay and Robin Johnston. Peter undertook higher surgical training in Cambridge where he studied for a PhD in the molecular responses to cerebral ischaemia.

Peter has a fond affection for Scotland and worked for 2 years as a Consultant in Aberdeen. The lure of sailing in and proximity to family in Somerset led to a move to Plymouth. Peter undertakes a broad range of neurosurgical procedures, including neurovascular, neuro-oncology and general neurosurgery. He has co-edited "Traumatic Brain Injury: A multidisciplinary approach" and edits the Neuroanatomy Section of Gray's Surgical Anatomy.

Peter is an enthusiastic teacher and has chaired the SAC in Neurosurgery, led National Selection, examined and assessed MRCS, FRCS and chaired the European Examination Board. He has led development of the Curricula in UK and Europe. He was also Professionalism Lead at the Peninsula Medical School for more than a decade.

Speakers

'The classification of traumatic brain injury'

Mark Wilson OBE is a Consultant Neurosurgeon and Professor of Brain Injury at Imperial College, London. He leads the neurotrauma service at St Mary's Major Trauma Centre, and he is also a pre-hospital care doctor with Kent, Surrey and Sussex Air Ambulance. He is co-founder of the GoodSAM App, which revolutionised emergency response by alerting trained responders to nearby cardiac arrests and facilitating remote assessment and management using innovative video technology. GoodSAM also manages 1 million NHS volunteers across the UK. He was awarded an OBE in 2020 for his significant contributions to pre-hospital care.

'Assessing responsiveness in brain injury'

David Menon CBE is Professor and Director of Research in the Department of Medicine at the University of Cambridge, and Consultant in Neurocritical Care at Addenbrooke's Hospital, Cambridge. He leads the multi-funder £10 million UK-TBI REpository and data PORTal Enabling discovery (TBI-REPORTER) project, which provides a national platform for TBI research; serves as Principal Investigator of the Vice-Coordinator CENTER-TBI, a €30 million FP7 European multi-centre study of precision medicine and comparative

effectiveness research in traumatic brain injury; and Coordinator of the International Traumatic Brain Injury Research (InTBIR) initiative. He was appointed as Emeritus Senior Investigator by the National Institute for Health Research (UK) in 2018. He has over 600 publications in peer reviewed journals with an 'h' index of 136 (Google Scholar), and has been listed as a "Highly Cited Researcher" by Clarivate for the last three years. He has been Principal or Co-Investigator on grants over $50 million over the last 20 years, and has contributed to major textbooks and international guidelines. He is joint lead author on two Commissioned Issues of the Lancet Neurology on Traumatic Brain Injury (TBI; released at the European Parliament in 2017, and at the CENTER-TBI meeting in 2022). He was Executive Editor of the Report of the UK All Party Parliamentary Group on Acquired Brain Injury.

'Can GCS predict rehabilitation outcomes?'

Teng Cheng Khoo is a Consultant in Rehabilitation Medicine and the Lead Clinician at the Neurorehabilitation service in NHS Greater Glasgow & Clyde. He also provides input to the Douglas Grant Rehabilitation Centre in NHS Ayrshire & Arran. He studied medicine at the University of Glasgow, before completing medical and rehabilitation medicine training in Glasgow and Edinburgh. He is a current Fellow of the European Board of Physical and Rehabilitation Medicine, and has special interests in spasticity and pain management in the neurorehabilitation cohort, including patients with acquired brain injury.

'50 years and still innovating: GCS-P and beyond'

Paul Brennan is Reader, Honorary Consultant Neurosurgeon and Clinical Director at the University of Edinburgh and NHS Lothian. His research spans the laboratory and the clinic, combining molecular, epidemiology and clinical investigation to guide rationale innovation to improve patient care.

He was co-founder of the British Neurosurgical Trainee Research Collaborative and has made a significant contribution to neurosurgical clinical research, most currently as Chief Investigator of the DENS study – concerning odontoid fracture management. Paul collaborates on bringing innovative technologies to the clinic, helping to develop the clinical and scientific evidence for adoption into routine care, such as the DxCover spectroscopic liquid biopsy test that can stratify patients with suspected brain tumours for priority brain imaging. Paul founded University of Edinburgh spin-out eoSurgical Ltd in 2012, and ran the company until 2023, leading innovation in surgical simulation training around the world. He is also co-director of the Compassion Initiative at the University of Edinburgh. Since 2014 Paul has been working with Professor Sir Graham Teasdale on projects related to application of the Glasgow Coma Scale, GCS, including developing the GCS Aid, GCS Pupils Score, and verbal component imputation tool. www.glasgowcomascale.org.

Session 3: The GCS in a Global context

Chair

Nigel Mendoza is a Consultant Neurosurgeon at Imperial NHS Healthcare Trust based at Charing Cross Hospital in London. He was appointed as an NHS consultant in 1995 and has established a general adult neurosurgical practice with a subspecialty interest in skull base and pituitary surgery.

He was elected to the council of the Society of British Neurological Surgeons in 2014, and then as Treasurer (2018 to 2022) and is currently the Vice President with a remit to develop Global Neurosurgery within the UK focusing on training, education and research, and indeed within the wider global neurosurgical community. He also sits on the European Associations of Neurosurgical Societies committee for global and humanitarian surgery. He continues as an examiner for the Joint College Intercollegiate Board in Neurosurgery.

'Rescuing the injured brain - traumatic brain injury in the global context'

Peter Hutchinson is Professor of Neurosurgery, NIHR Senior Investigator and Head of the Division of Academic Neurosurgery at the University of Cambridge. He is Director of Clinical Research at the Royal College of Surgeons of England and President Elect of the Society of British Neurological Surgeons. He has a research interest in the pathophysiology and treatment of acute brain injury, including leading the international RESCUE studies evaluating the role of decompressive craniectomy. He was awarded the Olivecrona Prize in 2015 and the Vilhelm Magnus Medal in 2023 for his work on brain injury. He is also Director of Clinical Studies at Robinson College, Past President of Clinical Neurosciences Section of the Royal Society of Medicine and Chief Medical Officer for the Formula One British Grand Prix.

GCS 'Global'

Paul Brennan is Reader in Neurosurgery at the University of Edinburgh and Honorary Consultant Neurosurgeon and Clinical Director in NHS Lothian, based at Edinburgh Royal Infirmary. Paul has been appointed to a personal chair in neurosurgery, commencing August 2024.

IV. The Glasgow Coma Scale 1974

The original paper was written by Graham Teasdale and Bryan Jennett in 1974. *Titled "Assessment of coma and impaired consciousness: A practical scale",* the paper was published in The Lancet and introduced a standardised method for assessing the level of consciousness in patients with acute brain injury. Only afterwards, as others used the shorthand of GCS for the 'Glasgow Coma Scale' did the acronym become popular. The original authors specifically avoided any reference to a single hospital in a bid to avoid obstacles to its widespread use.

THE LANCET, JULY 13, 1974

ASSESSMENT OF COMA AND IMPAIRED CONSCIOUSNESS

A Practical Scale

GRAHAM TEASDALE BRYAN JENNETT

University Department of Neurosurgery, Institute of Neurological Sciences, Glasgow G51 4TF

Summary A clinical scale has been evolved for assessing the depth and duration of impaired consciousness and coma. Three aspects of behaviour are independently measured—motor responsiveness, verbal performance, and eye opening. These can be evaluated consistently by doctors and nurses and recorded on a simple chart which has proved practical both in a neurosurgical unit and in a general hospital. The scale facilitates consultations between general and special units in cases of recent

The GCS was designed to provide a consistent and reliable way to communicate a patient's level of consciousness. It evaluates three key aspects of a patient's responsiveness, identified either by the specific response or as an allocated number.

1. **Eye Opening (E)**:
    - Spontaneous :4
    - To sound :3
    - To pain :2
    - None :1

2. **Verbal Response (V)**:
    - Oriented: 5
    - Confused :4
    - Words :3
    - Sounds :2
    - None :1
3. **Motor Response (M)**:
    - Obey commands :6
    - Localises to pain :5
    - Normal flexion :4
    - Abnormal flexion :3
    - Extension :2
    - None :1

The scores from these three categories are summed to give a total score, The Glasgow Coma Score, ranging from 3 to 15, with lower scores indicating more severe impairment of consciousness

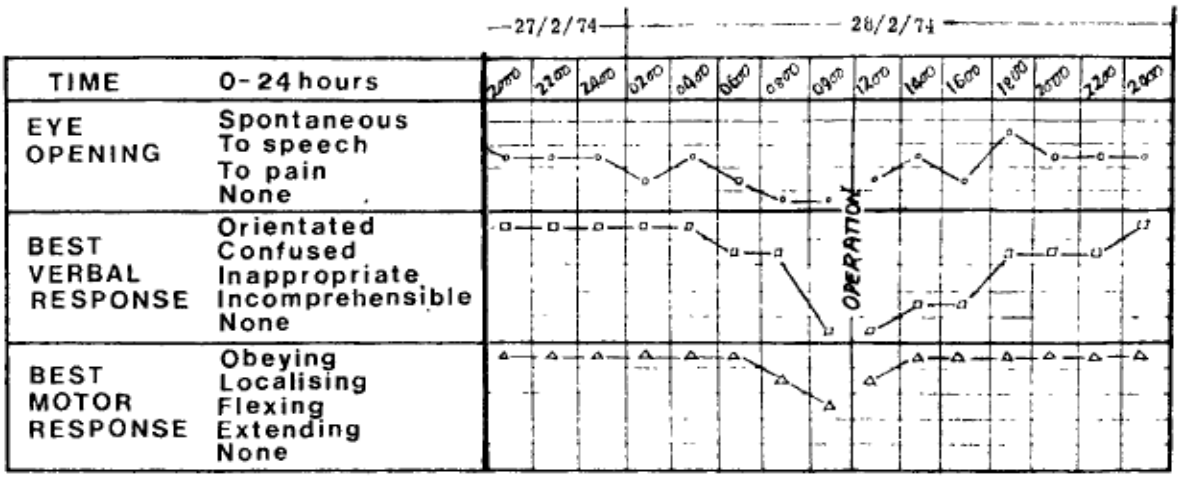


Chart for recording assessment of consciousness.

The scale was developed through careful comparison of different methods in a large number of patients at the INS. The authors aimed to create a scale that could be widely accepted and used in various clinical settings.

The GCS rapidly gained acceptance due to its simplicity and effectiveness. It became a vital tool in departments treating acute brain injuries from trauma and other causes. Its use was promoted

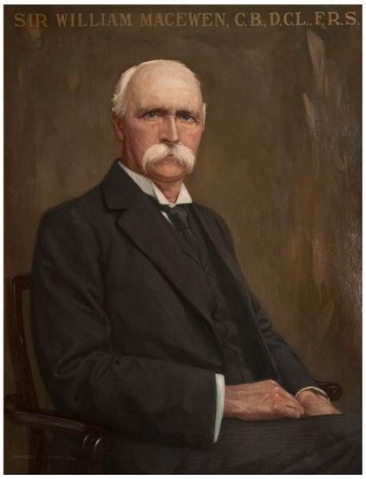
further by its inclusion in major trauma and life support protocols, such as the Advanced Trauma Life Support (ATLS) guidelines and the World Federation of Neurosurgical Societies (WFNS) grading scale for subarachnoid hemorrhage.

The GCS is established as an integral part of clinical practice and research in neurology and neurosurgery. It is used worldwide and has been translated into multiple languages, underscoring its global impact. The scale is continually referenced in medical literature and has been supported by research and practice.

The introduction of derived indices, such as the Glasgow Coma Scale Score (GCS score), which combines the three components into a single index, has further simplified communication and analysis in clinical practice. Additionally, the GCS-P (Glasgow Coma Scale – Pupils) score was developed to include pupillary reactivity as a measure of brainstem function, offering a more comprehensive assessment of a patient's neurological status.

The Glasgow Coma Scale's introduction in 1974 marked a significant advancement in the assessment and management of patients with impaired consciousness. Its development was driven by the need for a practical, reliable, and widely applicable tool, which Teasdale and Jennett successfully achieved. Today, the GCS remains a cornerstone of neurological assessment, reflecting its enduring value in both clinical and research settings.

IV. Neurosurgery in Glasgow



Sir William Macewen CB FRS FRCS (1848-1924) is recognised as the founding figure of neurological surgery. He pioneered clinical neurological location as a guide to surgery, the principles still in use today.

Macewen, born in Port Bannatyne on the Isle of Bute, pursued his medical education at the University of Glasgow, where he graduated with an MB ChB degree in 1869. His early career was marked by a deep interest in anatomy and surgery. After graduation he gained a position at the Glasgow Royal Infirmary. It was here that Macewen first made significant advances in the field of neurosurgery.

At a time when postoperative infections were a leading cause of death, Macewen's meticulous approach to sterilisation significantly reduced infection rates, thereby improving patient outcomes. His adoption of Joseph Lister's antiseptic and later aseptic principles was crucial.

In 1879, Macewen performed the earliest documented successful brain surgery by removing a meningioma from a young woman. This operation demonstrated not only his surgical skill, but also his innovative approach to preoperative diagnosis and planning. In the pre-imaging era, he utilised clinical signs and symptoms to localise the tumour, a revolutionary approach at the time.

In 1892 Macewen was appointed Regius Professor of Surgery at the University of Glasgow (a post held by Lister when Macewen was a medical student).

In addition to his work in neurosurgery, Macewen made significant contributions to orthopaedic surgery. He developed techniques for bone grafting and pioneered the use of metal plates and screws to fix fractures, a precursor to modern orthopaedic practices. His book, 'Osteotomy,' published in 1880, detailed these methods and served as a foundational text for orthopaedic surgeons.

In recognition of Macewen's extensive contributions to medicine, he was knighted in King Edward VII's coronation honours in 1902.

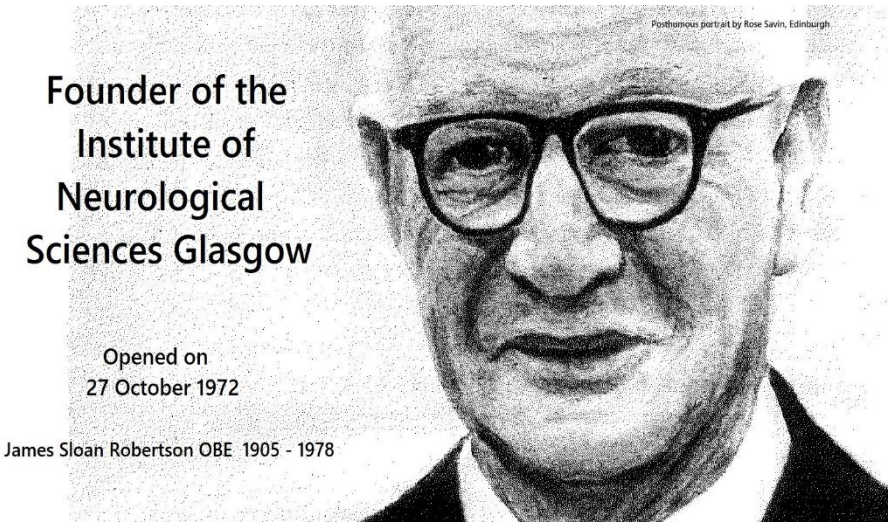
In 1916 he helped found the Princess Louise Scottish Hospital for Limbless Sailors and Soldiers in Erskine. With the assistance of engineers from shipbuilders on the Clyde, he then helped design the Erskine artificial limb.

He was also a founding figure in the development of surgical instruments designed specifically for neurosurgery, including Macewen's osteotome. Another of Macewen's contributions to clinical practice was the 'Macewen sign', a diagnostic indicator used to detect hydrocephalus in children in the pre-scanning era. This sign involves tapping the skull to detect abnormal resonance, which indicates the presence of fluid accumulation in the brain. Macewen's triangle is also identified as a safe site to operate on an otogenic brain abscess.

James Sloan Mutrie Robertson OBE (1905-1978) played a crucial role in the development of modern neurosurgery in the UK, particularly in Glasgow. He is often regarded as one of the unsung heroes of neurosurgery due to his significant yet frequently under recognised contributions to the field.

Robertson attended Ayr Academy before pursuing his medical studies at the University of Glasgow. He graduated with a BSc in 1925 and an MB ChB with honours in 1928. His early career was marked by a keen interest in both clinical practice and medical research, which laid the foundation for his future contributions to neurosurgery. After his initial training, Robertson worked as an assistant in the Physiology Department at the University of Glasgow from 1933 to 1936. His journey into neurosurgery began in earnest when he travelled to Canada to train under Wilder Penfield, at the Neurological Institute in Montreal. This experience significantly shaped his approach to neurosurgery and introduced him to techniques and concepts that he would later bring back to the UK.

Robertson returned to Glasgow and began practicing neurosurgery at the Royal Infirmary and the Sick Children's Hospital from 1939 to 1941. His work during this period was pivotal in establishing the safety and benefit of neurosurgery. One of his innovations was the use of the biphasic stimulator to delineate the boundaries of brain lesions through electrical impulses. This device was instrumental in the precise localisation of brain lesions, which is crucial for effective surgical intervention.

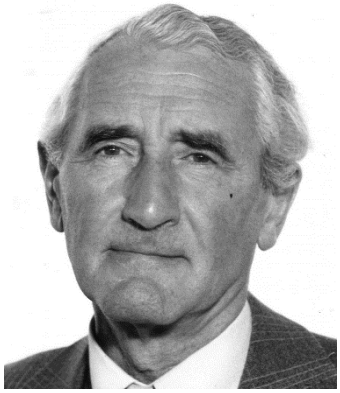


During World War Two, following the recommendation of a committee that included Penfield and chaired by Professor Charles Illingworth, the Glasgow West of Scotland Neurosurgical Unit was established at Killearn Hospital. Robertson was appointed lead neurosurgeon.

One of Robertson's lasting legacies is his role in the establishment of the Institute of Neurological Sciences in Glasgow in 1970. This institute brought together specialists in neurosurgery, neurology, and neuroradiology, fostering a multidisciplinary approach to the treatment of neurological disorders he had experienced in Toronto. First in Killearn then at the Southern General Hospital, the collaborative environment at the Institute led to significant advancements in the understanding and management of these conditions.

Throughout his career, Robertson was dedicated to advancing neurosurgical techniques and improving patient outcomes. His research covered a broad range of topics, including the physiology of brain lesions, intracranial pressure, and the surgical treatment of epilepsy. His innovative spirit was evident in his development of surgical instruments and techniques that enhanced the safety and efficacy of neurosurgical procedures.

Robertson’s commitment to excellence in neurosurgery and his innovative approach to medical challenges continue to inspire neurosurgeons today. His legacy is preserved not only in the techniques and devices he developed, but also in the institutions and practices he helped to establish.



Alistair Paterson (1917-2015) was a prominent neurosurgeon whose contributions significantly shaped neurosurgery and neurology in Scotland. Born in Dennistoun, Glasgow, in 1923, Paterson demonstrated early academic prowess, initially geared towards classics before switching to medicine. He graduated from Glasgow University’s school of medicine in 1940 and began his career as a House Surgeon under Sir Charles Illingworth at the Western Infirmary, Glasgow.

His medical career was interrupted by World War II, where he served as a regimental medical officer with the 1st Battalion Duke of Wellington’s Regiment from 1941 to 1946. During his military service, he provided critical care on the front lines in North Africa and Italy, earning mentions in dispatches for his bravery and skill, including saving a fellow officer's life.

Upon returning to civilian life in 1946, Paterson resumed his surgical training and began specializing in neurosurgery. His early neurosurgical work took him to the Glasgow and West of Scotland Neurosurgical Unit at Killearn Hospital and later to the prestigious Atkinson Morley Hospital in London. His international experience expanded with a year in Canada at McGill University and various roles in London, including the Sick Children’s Hospital at Great Ormond Street.

Paterson was deeply involved in teaching and international lecturing, sharing his expertise in the USA, Brazil, Argentina, Iran, and South Africa. He also authored numerous research papers, contributing to the advancement of neurology and neurosurgery. His professional legacy is most strongly associated with his tenure at Killearn and later at the Glasgow University’s Neurological Institute, where he led neurosurgery from 1970 until his retirement in 1984.

After retirement, he continued as an honorary clinical teacher until 1989, served as a medical advisor to the Ministry of Defence, and was a professor of neurosurgery in Saudi Arabia. In his later years, he ran a pain clinic at the Prince and Princess of Wales Hospice in Glasgow and earned a BA

Hons degree in Economics and Politics from the Open University. Paterson's career was marked by his surgical skill, intellectual rigor, and compassionate patient care, leaving a lasting impact on the medical community.

Sam Galbraith (1945-2014), neurosurgeon and government minister, became the world's longest surviving lung transplant patient after a lifesaving operation in his 40s. Born in Clitheroe, Lancashire, and raised in Greenock, Scotland, Galbraith excelled academically, graduating top of his class from Glasgow University in 1971. He began his neurosurgical career in 1972, influenced by his experiences in Glasgow and Chicago. His work on intracranial hematomas and head injury management was ground-breaking, earning him an MD in 1977. Galbraith's research significantly impacted the medical field, particularly his work on skull X-rays, which helped change hospital admission policies for head injury patients.

In 1982, at the age of 32, Galbraith became a consultant neurosurgeon at the Institute of Neurological Sciences, specializing in complex aneurysm surgeries. He produced approximately 60 research papers, contributing extensively to the field. His life took a significant turn in 1987 when he married Nicola, was elected as Labour MP for Strathkelvin and Bearsden, and was diagnosed with fibrosing alveolitis. Despite his health challenges, Galbraith underwent a successful lung transplant in 1990 and continued to live a full life, witnessing his three daughters grow up.

Transitioning to politics, Galbraith served as a sharp debater and a socially conscious politician. He held the shadow health brief for Labour and was appointed health and arts minister at the Scottish Office by Tony Blair in 1997. Known for his stance against market influences in healthcare, he abolished the internal market in Scotland, setting a precedent for the following years. His political career continued in the Scottish Parliament, where he held education and environment portfolios until his resignation due to ill health in 2001.

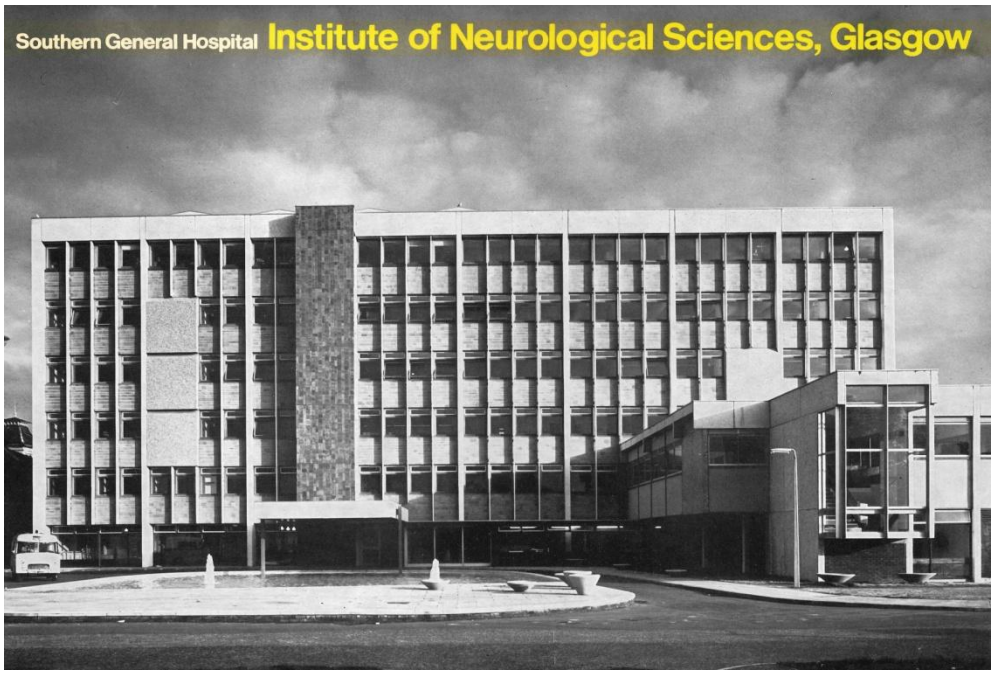
Beyond his professional life, Galbraith was passionate about various hobbies, including climbing, skiing, golf, and mycology. He also raised significant funds for charity. His contributions to medicine and politics, combined with his resilience and humanity, left a lasting legacy.

The Institute of Neurological Sciences

The INS was established in Killearn in 1941, and relocated in 1970 to the Southern General Hospital, now part of the Queen Elizabeth University Hospital. The creation of the INS was driven by the need for a comprehensive centre that could integrate clinical practice, research, and education in neurological sciences. The initial years focused on establishing state-of-the-art facilities and supporting leading medical professionals in neurology and neurosurgery.

During this period, one of the INS's notable achievements was the development of the Glasgow Coma Scale (GCS) by Professors Graham Teasdale and Bryan Jennett in 1974. The GCS provided a standardized method for assessing the consciousness levels of patients with brain injuries, becoming an essential tool in neurology and trauma care worldwide.

The 1980s marked a period of expansion and innovation for the INS. Advances in neuroimaging technologies, such as CT and MRI scanning, were integrated into clinical practice, enhancing both diagnostic and research capabilities. The INS also expanded its clinical services, offering specialised care for conditions such as epilepsy, multiple sclerosis, and neurodegenerative diseases.



Research at the INS during this decade focused on understanding the mechanisms of neurological diseases and developing new treatment approaches. Collaborations with academic and research institutions worldwide fostered a rich environment for scientific discovery and innovation.

The 1990s saw the INS consolidating its position as a leading centre for neurological sciences. The institute continued to attract major medical professionals and researchers, further strengthening its integrated clinical and research programs. The INS gained international recognition for its contributions to neurology and neurosurgery. Its research output increased significantly, with numerous publications in prestigious medical journals. The Institute's educational programs also flourished, training a new generation of neurosurgeons, neurologists, neuroradiologists, neuro-anaesthetists and neuro-ophthalmologists, many of whom would go on to make their own contributions elsewhere.

The turn of the millennium brought significant technological advancements to the INS. The adoption of minimally invasive surgical techniques and the use of advanced neuro-navigation systems improved the precision and safety of neurosurgical procedures. These innovations were complemented by a multidisciplinary approach to patient care, integrating neurology, neurosurgery, neuroradiology, and neuropsychology that were integral to the INS from its inception.

In 2015, the INS was incorporated into the newly opened Queen Elizabeth University Hospital, one of the largest and most advanced healthcare facilities in the UK. This provided the INS with increased access to state-of-the-art facilities and resources.

With thanks to our sponsors....

Gold

DIGBY BROWN
because it matters...
0333 200 5925
digbybrown.co.uk
INVESTORS IN PEOPLE We invest in people Platinum
PERSONAL INJURY AWARDS 2020
WINNER SCOTTISH LEGAL AWARDS 2022

INTEGRA

Bronze

B BRAUN
SHARING EXPERTISE

severn
SEVERN HEALTHCARE TECHNOLOGIES

Standard

stryker®

BRAINLAB

Special thanks to

The Royal College of Physicians and Surgeons of Glasgow

1599 at the Royal College

The Society of British Neurological Surgeons

SBNS Global Neurosurgery Initiative

Fiona Hainey

Margaret Naismith

Maeve Kilcullen

Allan Hall

Nigel Suttner

The INS 2024