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July - August 2026

## Paediatrics

Multidisciplinary treatment cuts  
concussion recovery time in half

### One scan, 22 biomarkers

The MRI upgrade that could  
transform brain disease diagnosis

### Phones on the wards

Hospital staff mobiles harbour  
drug-resistant superbugs

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# Prognosis

## Treating the child, not the symptom

In our focus on paediatrics in this issue, we look at two studies which converge on a common theme: paediatric outcomes may improve when care is coordinated across disciplines and extended to the wider family unit, rather than delivered in fragmented, single-modality episodes.

The first, the Concussion Essentials randomised trial from the Murdoch Children's Research Institute, addresses persisting post-concussion symptoms, which affect approximately 30% of children beyond the expected two-to-four-week recovery window. These children typically navigate sequential referrals across GPs, physiotherapists and psychologists. The trial evaluated a structured, symptom-targeted multidisciplinary intervention delivered over up to eight weekly sessions. Full recovery at three months was 62.5% in the intervention arm versus 37% under usual care, a risk difference of 25.5 percentage points, with lower symptom severity across all measured domains. The implication for practice is direct: early identification and coordinated, individualised care can materially accelerate recovery, and the model is a candidate for adaptation to telehealth and community settings to widen access.

The second study, a single-arm pilot from Northwestern and Lurie Children's Hospital, tested brief educational videos on safe sleep, infant crying and car safety delivered to first-time fathers in the newborn nursery. Knowledge improved significantly immediately post-viewing, but sleep-related gains did not persist: adherence to independent infant sleep fell to 79% at one month, while endorsement of car seats as a sleep location rose from 8.4% to 38.1%. This divergence between knowledge and behaviour implies that a single pre-discharge exposure is insufficient; post-discharge reinforcement, such as booster messaging, is likely required to sustain safe practice. The nursery itself emerges as a feasible and underused venue for father-directed intervention.

Together, the studies point in the same practical direction: multidisciplinary coordination, paternal inclusion, and sustained reinforcement after discharge are achievable levers, and each warrants extension into larger, multi-site evaluation.

Callan Emery

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# middle east monitor

Update from around the region

## Surgeons in Abu Dhabi complete GCC's first craniopagus twin separation

Surgical teams at Sheikh Khalifa Medical City (SKMC) in Abu Dhabi have completed the separation of craniopagus twins from Nigeria, marking the first procedure of its kind in the GCC region. The 15-month-old girls, Mercy and Goodness, were born with their heads joined at the top, with fused skulls and intertwined brain tissue and blood vessels.

### Surgical timeline and multidisciplinary input

The separation was achieved over six months and four surgeries, involving more than 60 doctors and clinicians drawn from the UAE, UK, Brazil and Nigeria. The team comprised neurosurgeons, craniofacial surgeons, paediatricians, anaesthetists, nurses, radiologists and rehabilitation therapists. Gemini Untwined, a charity specialising in the research and treatment of craniopagus twins, coordinated clinical input and helped bring relevant expertise to Abu Dhabi.

The surgical team was led by Professor Noor Ul Owase Jeelani MBE, founder of Gemini Untwined and a consultant paediatric neurosurgeon at Great Ormond Street Hospital for Children (GOSH). He described the case as “a rare and remarkable triumph – a testament to what’s possible when courage, compassion, and cutting-edge technology come together.”

### Technology and planning methods

Planning and execution drew on imaging technology, augmented reality simulation and 3D printing, enabling the team to map the twins’ vascular and neural systems collaboratively across multiple countries using a shared virtual reality environment. Coordination with Gemini Untwined also supported mixed reality-guided implant design and AI-enhanced surgical planning, underpinned by modelling carried out at the Zayed Centre for Research, Great Ormond Street Hospital.

Gravity-assisted brain protection combined with gradual tissue expansion is reported to have contributed to what is described as the fastest recorded separation of vertically conjoined twins.

### Post-operative reconstruction and recovery

Following separation, the twins’ skulls were reconstructed using custom 3D-printed titanium grafts. Mercy and Goodness are now reported to be recovering in the UAE, undergoing ongoing rehabilitation to develop motor skills and adapt to independent movement, ahead of an eventual return to Nigeria.

### Institutional and governmental response

The procedure was carried out under the supervision of the Department of Health



– Abu Dhabi. Her Excellency Reem bint Ebrahim Al Hashimy, Minister of State for International Cooperation, said the case was “more than a medical milestone; it is a story of compassion, courage, and global collaboration.”

His Excellency Mansoor Ibrahim Al Mansoori, Chairman of the Department of Health – Abu Dhabi, said the outcome reflected “the emirate’s pioneering capabilities, advanced infrastructure and notable medical competencies.”

Farhan Malik, Founder and Managing Director of PureHealth Group, noted that teams worked continuously across the pre-operative, operative and post-operative phases, including 24-hour monitoring, and thanked the teams from SKMC, Gemini Untwined, and surgical and care colleagues from the UK, Brazil and Nigeria. MEH

## Abu Dhabi Department of Health and Novartis sign MoU to advance genomics research

The Department of Health – Abu Dhabi (DoH) and Novartis Middle East FZE have signed a Memorandum of Understanding to explore collaboration in genomics research, scientific capacity building and advanced therapies. The agreement was signed on 26 June 2026 during a visit by a DoH delegation to the Novartis Biomedical Research site in San Diego, California, held alongside the BIO International Convention 2026.

### Building on an established genomics ecosystem

The collaboration is intended to connect

international scientific expertise with Abu Dhabi’s population genomics infrastructure. The partnership builds on Abu Dhabi’s leadership in genomics through the Emirati Genome Program, which has sequenced more than 900,000 genomes to date. These data are described as creating opportunities to support population-specific research and to inform more targeted approaches to prevention, diagnosis and treatment.

Through the MoU, the two organisations will work to support genomic and biomedical research relevant to the UAE population, while also advancing educa-

tion and training in genomics, data science and biomedical sciences. The agreement covers three principal areas: genomics research, scientific capacity building, and advanced therapies.

Dr Asma Ibrahim Al Mannaei, Executive Director of the Health Life Sciences Sector at DoH, said the collaboration “strengthens an ecosystem that already brings together genomics, research, health-care delivery and innovation within a single connected environment,” adding that combining international scientific expertise with Abu Dhabi’s capabilities in ge-

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nomics and precision medicine is intended to support “the translation of research into solutions that can improve outcomes for patients and communities.”

Mohamed Ezz Eldin, Head of Novartis GCC Cluster, said the agreement reflects a continuation of an existing relationship between the two organisations, saying that combining Abu Dhabi’s vision for health-care innovation with Novartis’ global scientific expertise creates an opportunity to support advances in genomics research, scientific capability building, and the future of precision medicine.

### Context of the agreement

The MoU follows a longstanding relationship between DoH and Novartis spanning



clinical research, health technology assessment and policy engagement in innovative treatment areas. The signing took place alongside a leadership engagement

and site tour at the Novartis facility, with discussions focused on future opportunities for collaboration in genomics and biomedical research. **MEH**

## Lilly and Department of Health–Abu Dhabi sign MoU on obesity and Alzheimer’s disease

Eli Lilly Drugstore LLC (Lilly) and the Department of Health – Abu Dhabi (DoH) have signed a Memorandum of Understanding (MoU) to address obesity and Alzheimer’s disease in the Emirate. The agreement was signed at the BIO International Convention 2026 in San Diego, USA, on 29 June 2026.

The collaboration brings together Lilly’s therapeutic experience in metabolic and neurodegenerative disease with Abu Dhabi’s population health data and clinical infrastructure, in support of the Emirate’s ambition to become a hub for life sciences research.

### AI-enabled obesity care model

Under the first of two strategic workstreams, Lilly and DoH intend to establish a joint task force to co-design an AI-enabled obesity and cardiometabolic care model tailored to the Abu Dhabi population. The initiative is intended to draw on population health data and Lilly’s expertise in metabolic disease to support risk stratification and individualised intervention strategies.

Dr Asma Ibrahim Al Mannaei, Executive Director of the Health Life Sciences



Sector at DoH, said: “Abu Dhabi has established one of the world’s most advanced ecosystems for precision medicine, built on population-scale genomics, advanced health data and clinical excellence. This collaboration with Lilly strengthens our ability to translate these capabilities into more personalised approaches to obesity and Alzheimer’s disease, improving outcomes for patients across the Emirate and beyond.”

### Alzheimer’s Disease Centre of Excellence

The second workstream centres on exploring the development of an Alzheimer’s Disease Centre of Excellence, building on an existing

neurodegenerative disease collaboration between DoH and Lilly. The stated aims include strengthening early detection, integrated digital cognitive screening, biomarker-based diagnosis, and care pathways spanning the Alzheimer’s disease continuum, alongside access to disease-modifying therapies.

Leena Aziz, Senior Director, Corporate and Government Affairs Gulf at Lilly, commented: “Together, we are advancing a model of care that brings together AI, population health insights, clinical excellence and breakthrough science to address two of the region’s most urgent health challenges: obesity and Alzheimer’s disease.” **MEH**



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## Metabolic partners with Roche to offer plasma p-Tau217 testing for early Alzheimer's detection

Dubai-based Metabolic (formerly GluCare.Health) has announced a partnership with Roche Diagnostics to become one of the first healthcare providers globally to offer the Elecsys® pTau217 plasma immunoassay as a research screening tool for early Alzheimer's disease detection in patients with metabolic risk factors, including diabetes, obesity, hypertension and dyslipidaemia.

The initiative, conducted at Metabolic's Dubai facilities, targets asymptomatic individuals whose metabolic conditions are known to raise Alzheimer's disease risk, distinguishing it from existing commercial offerings that typically focus on patients already presenting with cognitive impairment.

### Diagnostic performance and study design

The Elecsys pTau217 assay is a validated blood-based biomarker with diagnostic performance comparable to invasive cerebrospinal fluid testing and PET imaging. A positive result indicates a high likelihood of amyloid pathology, a hallmark of Alzheimer's disease, while a negative result suggests amyloid pathology is unlikely, potentially sparing patients further invasive investigation. Indeterminate results require additional testing.

Metabolic and Roche Diagnostics Middle East will run the programme as a

prospective, non-interventional cohort study enrolling 500 participants over 12 to 24 months, comparing p-Tau217 results against clinical assessments and CSF biomarkers to evaluate the assay's accuracy and its suitability as a tool for longitudinal monitoring in high-risk populations.

The work builds on a screening pathway Metabolic introduced two years ago, when it began routine cognitive function testing in diabetic patients in light of the "Type 3 Diabetes" concept, which describes the association between insulin resistance, chronic inflammation and cognitive impairment.

### Hybrid care pathway for patients at risk

Patients who return a positive result are offered enrolment in Metabolic's Hybrid Care Program, which combines dietitians, personal trainers and health coaches with wearable-derived digital biomarkers tracking sleep, stress, physical activity and glucose levels. There is emerging evidence that p-Tau217 levels respond to interventions such as exercise, as well as to recently approved Alzheimer's medications, extending the biomarker's utility beyond diagnosis and prognosis into treatment monitoring.

Dr Ihsan Almarzooqi, Co-founder and Managing Director of Metabolic, said: "When Alzheimer disease develops, the



Dr Ihsan Almarzooqi, Co-founder and Managing Director of Metabolic.

first biomarker to show up is p-Tau217 in the plasma or cerebrospinal fluid, more than 20 years before symptom onset. We always believed in cognitive function testing for metabolically impaired patients but never had a biomarker before."

Crista Bassil, Medical Affairs, Access, and Policy Lead at Roche Diagnostics Middle East, said the company is "working toward a future where the condition can be detected and addressed earlier".

Following CE Mark approval, the assay will be deployed across Roche's installed instrument base in CE Mark-accepting countries, with expansion to the United States contingent on FDA approval expected later this year. MEH

## Sultan Bin Abdulaziz City achieves HIMSS EMRAM Stage 7 in digital health milestone for Saudi Arabia

Sultan Bin Abdulaziz Humanitarian City (Sultan City), one of the largest non-profit rehabilitation and medical facilities in the Middle East, has attained HIMSS EMRAM Stage 7, the highest level of digital maturity for electronic medical record adoption recognised by the Healthcare Information and Management Systems Society (HIMSS).

The designation places the 510-bed Riyadh-based facility among a select group of healthcare organisations worldwide to have achieved a fully paperless clinical

environment, underpinned by advanced analytics, comprehensive data governance and interoperability across care settings.

### A decades-long transformation

Established by the late Crown Prince HRH Prince Sultan Bin Abdulaziz and officially inaugurated on 30 October 2002, Sultan City occupies an area of one million square metres in the Banban district north of Riyadh. The institution has treated more than 1.1 million patients drawn from

across the Middle East, providing surgical, rehabilitative, therapeutic and supportive services through an integrated, multidisciplinary care model.

Sultan City's pathway to Stage 7 reflects a sustained programme of clinical leadership, governance reform and investment in integrated digital infrastructure. Among the technology partners contributing to this transformation is InterSystems, whose TrakCare platform underpins core clinical and administrative workflows across the organisation.

## BioSapien receives regulatory approval for Phase I colorectal cancer trial in Abu Dhabi

BioSapien, a biotechnology company specialising in localised cancer drug delivery, has received regulatory clearance to commence Phase I clinical trials in Abu Dhabi, UAE, for its MediChip™ platform – a 3D-printed, slow-release drug delivery device designed to deliver chemotherapy directly to tumour tissue.

### Regulatory approvals secured

Approvals have been granted by three bodies: the Department of Health – Abu Dhabi (DoH) for its Investigational New Drug (IND) submission; the Emirates Drug Establishment (EDE) for clinical trial conduct; and the DoH's Institutional Review Board (IRB) for shortlisted clinical sites.

### Localised delivery to minimise systemic toxicity

MediChip™ is attachable to any tissue and works by concentrating drug exposure within the tumour microenvironment, thereby reducing systemic distribution and associated

side effects. The platform is designed to maintain therapeutic efficacy whilst requiring lower overall drug quantities. BioSapien's initial indication is colorectal cancer – the most prevalent cancer in men in Abu Dhabi, the third most common in women after breast and thyroid cancer, and the third most common cancer overall. The company intends to expand the platform to pancreatic and lung cancers, as well as non-oncological indications, in subsequent phases.

### Abu Dhabi's clinical research ecosystem

Dr Asma Ibrahim Al Mannaei, Executive Director of the Health Life Sciences Sector at the DoH, noted that the trial “reflects the value of bringing together enabling regulation, research excellence and world-class healthcare infrastructure within a single ecosystem.”

Dr Khatija Ali, CEO and Founder of BioSapien, described the regulatory process as “rapid and professional” and confirmed the company is “ready for Phase 1 trials to begin imminently.” MEH



### Clinical integration and decision support

Validation of EMRAM Stage 7 confirms that Sultan City has achieved comprehensive digital integration across its clinical environment. This includes fully electronic documentation, closed-loop medication management, advanced clinical decision support, and the capacity to apply health data toward continuous improvement in care quality and patient safety.

The unified electronic health record environment gives care teams a comprehensive view of patient information spanning clinical, administrative and operational domains, supporting more informed decision-making, improved care coordination and greater efficiency throughout the patient journey.

### Alignment with national health strategy

Sultan City says that the achievement supports the Kingdom's healthcare transformation agenda and aligns with the objectives of Saudi Vision 2030, illustrating how digitally enabled care models can improve patient outcomes, enhance safety and drive operational efficiency. The organisation indicated that Stage 7 status provides a foundation for further innovation, including the expansion of data-driven and predictive care approaches.

Dr Abdullah Bin Zarah, Chief Executive Officer of Sultan City, said: “This achievement reflects the dedication and collaboration of our teams across all disciplines. Achieving HIMSS EMRAM Stage 7 reinforces our commitment to

delivering world-class, digitally enabled care and supports our ambition to continuously improve patient outcomes through innovation.”

Ali Abi Raad, Managing Director for the Middle East, South Africa and India at InterSystems, said: “We are proud to contribute to Sultan City's digital transformation journey. This milestone highlights the importance of collaboration and integrated technology in supporting healthcare organisations to achieve sustainable, high-impact progress.”

The achievement positions Sultan City as a benchmark for digital healthcare maturity in the region, and is presented as further evidence of progress toward a modern, data-driven health system in Saudi Arabia consistent with international best practice. MEH



# the laboratory

Medical research news from around the world

## Immune overdrive, not exhaustion, drives chronic critical illness in ICU trauma patients

New research published in *The Journal of Immunology* overturns a long-held assumption about why some trauma patients linger in intensive care. Rather than immune suppression, a distinct pattern of overactivity – centred on Th17 cells and the cytokine IL-17A – appears to drive chronic critical illness. The findings point towards a testable immune signature that clinicians could use at ICU admission to identify high-risk patients and intervene earlier.

For decades, clinicians and researchers assumed that trauma patients who failed to recover quickly were suffering from a kind of immune exhaustion – a depletion of the body's defences that left them vulnerable to infection and organ dysfunction. A study published on 25 June 2026 in *The Journal of Immunology* challenges that model directly, and the implications for how intensivists manage severely injured patients could be significant.

The research identifies a discrete immunological profile present in patients who go on to develop chronic critical illness (CCI) – defined as ICU dependency beyond 14 days – and suggests that targeted biomarker testing at admission could flag these individuals before their condition deteriorates.

“Our findings are highly novel, challenging what scientists have long thought about the immune changes that cause organ dysfunction and mortality in severely injured trauma patients. Rather than the immune system being exhausted, our data show overactivity and dysfunction,” said Dr Scott Brakenridge, Professor of Surgery at the University of Washington and senior author of the study.

### A misdirected immune response, not a failed one

The study prospectively enrolled blunt and penetrating trauma patients admitted to the ICU, collecting blood samples on days 4, 7, 10, 14, and 28. Patients were stratified into three groups: rapid recovery (RR, discharged within 7 days), intermediate (IM, days 7-14), and CCI (more than 14 days). Roughly 20% of trauma patients develop CCI, but until now the immunological drivers were poorly understood.

Across all groups, researchers observed common trauma-associated changes including neutrophilia and early T cell lymphopenia. What distinguished CCI patients, however, was a markedly different trajectory. As the author's note in their abstract, CCI patients exhibited “a distinct immunophenotype characterised by elevated neutrophil counts, recovery of total CD3+ T cells by day 7, preserved inducible interferon (IFN) production, and a selective expansion of CD4+ T helper 17 (Th17) cells.”

Functional assays reinforced this picture, revealing sustained cytokine responses – persistent IFN and IL-17A production – rather than the blunted immunity previously hypothesised. Plasma analysis showed “prolonged elevation of IL-17A, IL-17C, IFN, and IL-10, indicating a mixed but enduring pro- and anti-inflammatory state.”

IL-17A as an early warning signal

One finding stands out for its clinical potential. IL-17A – a cytokine associated with inflammatory signalling – emerged as the most discriminating marker between groups. Crucially, some CCI patients showed elevated IL-17A as early as day one of ICU admission.

### IL-17A as an early warning signal

“IL-17A was the most informative marker that distinguished CCI patients from RR or IM. Some CCI patients had elevated IL-17A even at day 1 in the ICU, suggesting almost immediate immune dysregulation,” said Dr Brakenridge.

This early signal matters enormously at the bedside. CCI patients also developed infections earlier and more frequently than their counterparts, with nearly one-third experiencing their first infection – primarily pneumonia – within four days of admission, and more than 80% doing so within eight days.

**Towards a test that could change ICU care**

Caleb Kim, PhD candidate at the University of Minnesota and first author of the paper, outlined the translational ambition: “Developing a test for this profile would allow clinicians to tailor patient care, quickening recovery time and saving lives.”

### Towards a test that could change ICU care

Understanding that CCI is driven not by classic immunosuppression but by “an IL-17-skewed immune programme coupled with ineffective pathogen control” re-frames how future interventions might be designed. The persistent Th17/neutrophil axis identified here represents a plausible therapeutic target – one that would have been overlooked under the old immunosuppression paradigm.

The research team plans to continue delineating the precise immune mechanisms involved, with the longer-term goal of developing a clinically deployable test. MEH

Journal reference:  
Kim, C., Brakenridge, et al. (2026). Distinct immune trajectories after severe trauma identify a Th17-biased immunophenotype in chronic critical illness. *The Journal of Immunology*. <https://doi.org/10.1093/jimmun/vkag125>

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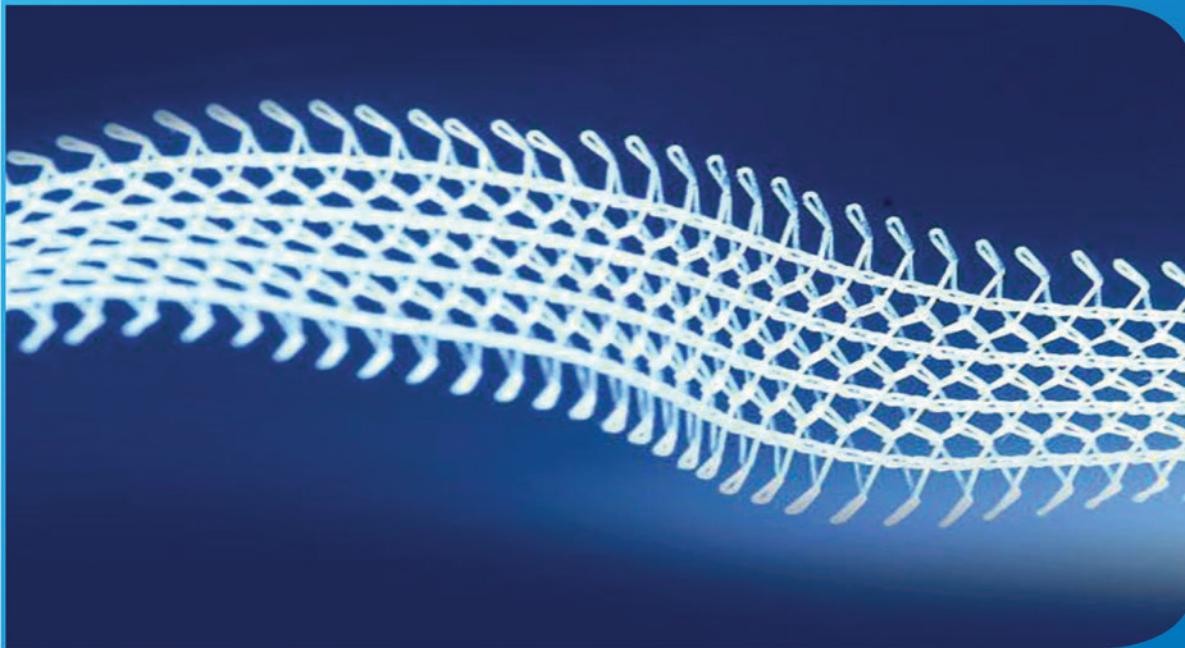
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## A 13-second eye test that could transform consciousness prognosis in the ICU

A rapid bedside pupillometry assessment measuring a previously overlooked phase of the pupil's response to light may predict recovery of consciousness in patients with severe brain injury up to seven days in advance, according to research presented at the European Academy of Neurology (EAN) Congress 2026 in Geneva. The findings, if confirmed, could meaningfully change how intensivists approach prognostication in acute disorders of consciousness.

For clinicians working in intensive care, few questions are as clinically and ethically consequential as whether a patient with severe brain injury will regain consciousness. Existing neurological monitoring tools offer a snapshot of current brain function, but their ability to forecast recovery trajectories remains limited. New research suggests that a subtle, late-occurring phase of the pupillary light response – one that has largely been ignored until now – may hold precisely that prognostic value.

### A signal hiding in plain sight

The study, presented as an abstract at the 12th EAN Congress (Geneva, June 2026), examined the late light-off response (LOR): the phase of the pupil's reaction that occurs after the immediate constriction and dilation cycle following removal of a light stimulus. Researchers from Copenhagen University Hospital Rigshospitalet and the Danish Technical University enrolled 250 patients with impaired consciousness following both traumatic and non-traumatic brain injury, alongside 30 age- and sex-matched healthy controls. All participants underwent daily automated pupillometry and standardised neurological assessments for up to 20 days in the ICU.

The headline finding was clear: late LOR latency independently predicted improvement in consciousness seven days later, even after controlling for

baseline neurological status, time since injury, sedation level, and injury type. Crucially, it did so where established measures failed – neither the widely used Neurological Pupil Index (NPi) nor pupillary light reflex (PLR) latency predicted later gains in consciousness.

### What makes this clinically significant

The implications for clinical practice are considerable. Prognosticating in disorders of consciousness is notoriously difficult, and premature withdrawal of care based on overly pessimistic assessments remains a genuine concern. A simple, fast, non-invasive marker that can be integrated into existing ICU workflows – without requiring new hardware – represents a practical step forward.

Lead author Dr Poul Laigaard explained the tool's accessibility: "The light-off response is measured using a handheld automated pupillometer in much the same way as current pupil measurements. The entire assessment takes only 13 seconds per eye, making it a fast and practical bedside tool that could potentially be integrated into routine ICU care."

Importantly, the late LOR was not correlated with a patient's level of responsiveness on the day of measurement – suggesting it is capturing something distinct from momentary brain state. As Dr Laigaard put it: "Current tests of pupillary function tell us how the brain is responding in the moment, but the late light-off response may provide clues about the brain's potential for recovery. This could help us better

understand which patients may improve in the days ahead."

### Subgroup signals and the need for validation

The predictive relationship appeared strongest in patients not receiving sedative medication and in those with anoxic–ischaemic brain injury – a condition in which the brain is deprived of both oxygen and blood flow, and one that carries a particularly guarded prognosis. However, the researchers are careful to flag that these subgroup findings were exploratory.

Senior author Professor Daniel Kondziella noted that the work warrants broader scrutiny: "We believe this is an important observation that deserves further investigation. Larger, multicentre studies are needed to determine whether this approach could be used routinely for bedside monitoring and prognosis."

### Next steps

The late LOR is not yet ready for routine clinical use – validation in larger, multicentre cohorts is the necessary next step. But the signal is promising, and the barrier to adoption is low given that compatible pupillometry devices are already present in many ICUs. If confirmed, this overlooked 13-second measurement could become a valuable addition to the intensivist's prognostic toolkit. MEH

#### Reference:

Laigaard, P., Stückler, S., Eigenbrodt, A., et al. (2026). Pupillary light-off latency predicts 7-day improvement in consciousness in patients with acute disorders of consciousness. Abstract A-26-17842. Presented at the 12th EAN Congress, Geneva, Switzerland.



## Researchers grow retinal endothelial cells from stem cells for the first time, opening path to new diabetic retinopathy treatments

For the first time, researchers at Duke University have derived functional retinal endothelial cells from induced pluripotent stem cells, demonstrating both therapeutic and disease-modelling potential. Published on 30 June 2026 in *Nature Biomedical Engineering*, the findings point towards scalable cell-based treatments for conditions such as diabetic retinopathy – the leading cause of vision loss in working-age adults.

The clinical implications are considerable. Diabetic retinopathy affects millions worldwide, yet treatment options remain limited, partly because the specialised blood vessel cells lining the inner retina are notoriously difficult to study and nearly impossible to obtain in sufficient quantities. This research changes that calculus by offering a reproducible, renewable source of human retinal endothelial cells grown entirely in the laboratory.

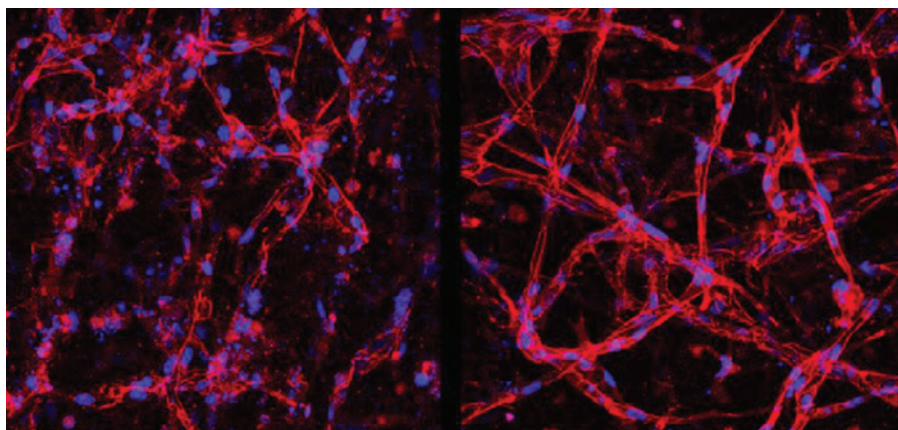
### A barrier built to last – and to break

The inner blood–retina barrier (iBRB) is one of the most selective interfaces in the human body, governing the movement of nutrients, oxygen, and pharmaceuticals into retinal tissue. It is formed primarily by retinal endothelial cells (RECs), which create tight junctions with neighbouring pericytes and astrocytes. When this barrier breaks down – as it does progressively in diabetic retinopathy – ischaemia, leakage, and ultimately irreversible vision loss follow.

“Retinal vascular diseases affect millions of people in the US, but our understanding remains limited, hindering our ability to discover and develop new therapeutics,” said Sharon Gerecht, the Paul M. Gross Distinguished Professor and Chair of Biomedical Engineering at Duke. “Using human stem cells, we generated the cells found in retinal blood vessels, paving the way for new therapeutic approaches.”

### From stem cells to retinal cells

The Duke team derived their iPSC-derived retinal endothelial cells (iRECs) by harnessing the Wnt– $\beta$ -catenin signalling pathway, specifically the Norrin–Frizzled4 (Fz4) axis, which is known to be essential for retinal vascular development. Starting from human induced pluripotent stem cells (hiPSCs), the researchers induced mesodermal differentiation, introduced the transcription factor ETV2 via elec-



This image depicts both healthy (right) and deteriorated (left) human retinal endothelial cells, which are essential for maintaining eye sight. The deterioration is caused by low oxygen and high glucose levels, mimicking conditions found in diabetic retinopathy.

trporation to drive endothelial commitment, then added Norrin and vitronectin to confer retinal specificity. A final maturation step using RepSox – a TGF $\beta$ –ALK5 inhibitor that also activates Notch and Wnt signalling – produced cells expressing canonical endothelial markers alongside REC-specific proteins such as Claudin-2 and Frizzled4.

Transcriptomic analysis confirmed the cells’ distinct identity. As the authors note, iRECs “show genetic, protein and functional fidelity as well as unique retinal features,” with 1,004 genes significantly upregulated compared to non-tissue-specific endothelial controls, including key REC markers *FZD4*, *IGF2*, and *CLDN10*.

### Rescuing the ischaemic eye

In the oxygen-induced retinopathy (OIR) mouse model – the standard preclinical tool for studying diabetic retinopathy – intravitreal injection of iRECs led to significant reductions in both vaso-obliteration and pathological neovascularisation. The cells integrated into host vasculature, formed perfusable lumenised networks in hypoxic avascular zones, and restored retinal permeability. Crucially, this oc-

curred in immunocompetent C57BL/6 mice, lending the findings greater clinical relevance.

“The tests showed that these lab-grown cells have promise for preventative treatments, especially since they should be easier and cheaper to obtain using our technique,” said Parker Esswein, PhD student and first co-author.

### A platform for disease modelling

Beyond therapeutics, the team constructed an iBRB-on-a-chip microphysiological system incorporating both iRECs and iPSC-derived retinal pericytes (iRPCs). This co-culture model recapitulated healthy and diabetic iBRB states, with the iRPCs further tightening barrier properties to levels consistent with in vivo permeability measurements. Exposure to high glucose and hypoxia faithfully reproduced the junctional protein disruption seen clinically in diabetic retinopathy.

The authors conclude that iRECs and iRPCs “can advance iBRB research and precision medicine, accelerating therapeutic discovery.” A patent is pending covering both the cell therapy and the in vitro modelling applications. MEH

Journal reference:

Journal reference: Lin, Y.-Y., Esswein, P., Ramirez, L., et al. (2026). Derivation of functional retinal endothelial cells from human pluripotent stem cells for therapeutics and modelling. *Nature Biomedical Engineering*. <https://doi.org/10.1038/s41551-026-01712-9>





## Stand up and walk: hourly movement breaks cut fatigue and lift mood without hurting work output

A large-scale pragmatic study published in the *British Journal of Sports Medicine* has found that five-minute walking breaks taken every hour offer the best balance between practicality and effectiveness for countering the harms of prolonged sitting. The findings, drawn from nearly 20,000 adults under real-world conditions, have direct implications for public health guidelines and workplace health policy.

Adults in high-income countries now spend, on average, 11–12 hours each day sedentary – more than three-quarters of their waking hours. That level of inactivity carries well-documented risks: heightened susceptibility to cardiovascular disease, type 2 diabetes, poor mental health, and premature death. Yet despite growing recognition of the problem, public health guidance has remained frustratingly vague, amounting to little more than “sit less, move more.” A major new study from Columbia University Medical Center sets out to change that, offering some of the clearest real-world dosing data yet on how frequently people should break up their sitting time – and by how much.

### From laboratory to living room

Previous research establishing the benefits of movement breaks has largely been conducted under tightly controlled laboratory conditions, leaving open the question of whether such interventions translate to everyday life. To address this gap, Dr Keith Diaz and colleagues embedded a pragmatic two-week intervention within the NPR Body Electric podcast series, recruiting 19,342 adults spanning a wide range of ages, occupations, and work environments – including remote, hybrid, and in-person workers.

Participants self-selected one of three break frequencies – every 30, 60, or 120 minutes – and were instructed to take five-minute walking breaks at their chosen interval throughout all waking hours. Crucially, no reminders or external prompts were provided, making

this a genuine test of real-world adoptability. Of those enrolled, 59.4% ( $n = 11,484$ ) completed the seven-day baseline period and began the intervention.

### All frequencies feasible, but hourly breaks win on balance

Implementation potential was assessed using validated measures of feasibility, acceptability, and appropriateness. All three break frequencies scored above the viability threshold of 3.0 on a five-point scale. However, feasibility scores climbed as break frequency decreased – unsurprisingly, pausing every two hours proved easier to sustain than pausing every 30 minutes.

Effectiveness told a different story. Improvements in fatigue, positive affect, and negative affect followed a dose-response pattern, with more frequent breaks yielding greater benefits. The 30-minute arm produced the strongest psychosocial improvements, but also the lowest feasibility and compliance scores. The 120-minute arm was the most practical but the least effective, with no outcomes crossing the minimal important difference (MID) threshold – the threshold representing changes that participants themselves perceive as genuinely meaningful.

That left the hourly break as the clear sweet spot. As the authors write in their conclusion, “hourly breaks offered the best balance between feasibility and effectiveness” – a finding reinforced by the fact that nearly half of all participants had voluntarily chosen the 60-minute frequency at enrolment.

### Good news for employers

One concern that has historically ham-

pered workplace uptake of movement breaks is the fear that they might dent productivity. The study directly addresses this. “Concerns that movement breaks might disrupt work productivity have been documented as a perceived barrier to implementation/adoption. However, our findings counter this perception,” the authors state. Whilst no break frequency produced work performance improvements that crossed MID thresholds, all arms generated small favourable changes – engagement improved by 4–7% and performance by 1–3% on average – and crucially, no harm to productivity was observed.

### Clinical and policy implications

For clinicians advising patients with sedentary occupations, or for occupational health practitioners developing workplace programmes, these findings offer something unusually actionable. The authors argue that their data “support movement breaks as a potentially viable public health strategy and provide new insights into feasible and effective dosing for real-world implementation that can be integrated into existing guidelines.”

The study is not without limitations. Outcomes were entirely self-reported, the participant pool was predominantly white, female, and highly educated, and the intervention lasted only two weeks – leaving longer-term sustainability an open question. The lack of a true no-treatment control group also limits causal inference, though the dose-comparison design provides useful internal contrasts. MEH

#### Journal reference:

Diaz, K. M., Murdock, M. E., Serafini, M. A., et al. (2026). Evaluating movement breaks as a public health strategy to mitigate the harms of prolonged sitting: a large-scale pragmatic intervention. *British Journal of Sports Medicine*. <https://doi.org/10.1136/bjsports-2025-111221>

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## Lurie Children's Expands World-Class Cardiac Care for Children With Complex Pulmonary Artery Conditions

Ann & Robert H. Lurie Children's Hospital of Chicago is widely recognized as one of the most comprehensive centers for families around the world seeking treatment for complex congenital heart disease in infants, children and young adults.

In 2025, the hospital's renowned Heart Center expanded its expertise by recruiting pediatric cardiovascular-thoracic surgeon Dr. Elisabeth Martin and launching its Pulmonary Artery Reconstruction (PAR) Program.

This highly specialized program focuses on restoring or rebuilding the pulmonary arteries – the vessels that carry blood from the heart to the lungs – in children whose arteries are blocked, underdeveloped or missing at birth. Dr. Martin and her colleagues have advanced training in treating conditions such as Tetralogy of Fallot with pulmonary atresia and major aortopulmonary collateral arteries (MAPCAs), unilateral absence or discontinuity of a pulmonary artery, single-ventricle physiology and Williams and Alagille syndromes, among others.

### Unifocalization

Dr. Martin brings to Lurie Children's rare expertise in unifocalization, a highly complex surgical procedure used when a child does not have normal pulmonary arteries. In these cases, the body often develops alternative blood vessels called major aortopulmonary collateral arteries (MAPCAs). These vessels are not organized like typical pulmonary arteries, making it difficult for the lungs to receive blood efficiently.

During unifocalization, surgeons collect these collateral vessels – along with any native pulmonary artery branches that exist – and reconstruct them into a single functional pulmonary artery system. This rebuilt

pathway is then connected to the heart, allowing for more normal and efficient blood flow to the lungs. For many children, particularly those with pulmonary atresia with MAPCAs or discontinuous pulmonary arteries, this surgery can be life-changing.

Lurie Children's is also recognized for its comprehensive perioperative care. Recovery typically begins in the cardiac intensive care unit followed by close monitoring on a specialized cardiac floor. As children grow, the reconstructed pulmonary artery system requires regular evaluation and some patients may need additional procedures to ensure continued optimal function.

Lurie Children's Heart Center – ranked No. 1 in Cardiology and Cardiac Surgery in *Newsweek's* list of America's Best Children's Hospitals 2025 – brings together an expert team of pediatric heart surgeons, cardiologists, imaging specialists, anesthesiologists and intensive care experts. This collaborative approach ensures that every child receives an individualized treatment plan based on their unique anatomy and medical needs. Detailed diagnostic imaging, including CT scans, MRI, echocardiography and cardiac catheterization, allows the team to understand each patient's condition with exceptional precision.

In addition to pulmonary artery reconstruction, the Heart Center provides a full spectrum of services, ranging from fetal cardiology and cardiac disease prevention to pediatric interventional cardiology and heart transplantation.



Dr. Elisabeth Martin, pediatric cardiovascular-thoracic surgeon, Ann & Robert H. Lurie Children's Hospital of Chicago

### International Patient Services

Families traveling from abroad benefit from Lurie Children's extensive experience caring for international patients, including assistance with medical record coordination, travel planning and follow-up care. Social workers, interpreters, child life specialists and dedicated international patient services staff support families throughout their stay.

For children with some of the most complex heart conditions, Lurie Children's offers advanced surgical expertise, comprehensive multidisciplinary care and a deep commitment to long-term patient well-being.

• Learn more at [LurieChildrens.org](https://LurieChildrens.org) 



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# Knowledge should travel, not children: A new era of precision child health

Every child deserves the chance to receive the right diagnosis and the right treatment – regardless of where he or she is born. Yet for millions of children living with rare diseases, this remains an unmet need. Families often spend years searching for answers while valuable opportunities for treatment, prevention, and informed care may be lost. Christoph Klein, MD, PhD explains Dr. von Hauner Children's Hospital's mission to provide equitable access to advanced healthcare.

Recent advances in genomics, bioinformatics, and precision medicine are transforming this reality. What was once impossible is increasingly becoming routine: identifying the molecular cause of disease, connecting patients to targeted therapies, and providing families with clarity and hope.

The challenge is no longer scientific possibility, but equitable access. Building sustainable diagnostic capacity, fostering international collaboration, and sharing knowledge across borders are essential to ensure that the benefits of precision medicine reach children everywhere. Knowledge should travel, not children.

For generations, excellence in medicine has been concentrated in specialized clinical centres. Institutions such as the Dr. von Hauner Children's Hospital of LMU Munich have demonstrated how clinical expertise, scientific discovery, and innovation can transform the lives of children with rare and complex diseases. Yet the future of precision medicine should not depend on moving patients across countries and continents. The future of medicine will depend on sharing knowledge, building partnerships, and creating networks that allow expertise to reach children wherever they live.

At LMU Munich, we are convinced that precision medicine is entering a new era. Advances in genomics, molecular diagnostics, artificial intelligence, and translational science are providing unprecedented opportunities to reinterpret disease phenotypes, understand disease mechanisms and guide individualized curative care. What began as a revolution in rare disease diagnostics is increasingly reshaping paediatrics as a whole.

Guided by our conviction that insights

from rare diseases often illuminate common diseases “from rare to common“, we believe that critical insights in rare disease research have profound implications for diagnosis, prevention and treatment across medicine, for children and adults alike.

However, technology alone is not enough.

The true value of molecular diagnostics emerges when genomic information is interpreted in the context of comprehensive clinical expertise, deep biological understanding, and multidisciplinary collaboration. No single institution possesses all the knowledge required to solve every complex disease. Progress increasingly depends on connecting expertise across disciplines, institutions, and countries. We are challenged to build networks of networks that transcend traditional healthcare structures.

Our conviction that knowledge – not children – should travel has shaped our commitment to international collaboration and global alliances. Through mutual trust and partnerships with hospitals, universities, physicians, scientists, patient organizations, and philanthropic initiatives worldwide, we seek to ensure that children can benefit from world-class expertise while remaining close to their families and communities.

Together with philanthropic partners and international collaborators, we support the broader mission of advancing precision child health through education, scientific exchange, and the development of sustainable partnerships. Together, we seek to accelerate the flow of knowledge, expertise, and innovation across borders. Geography should never determine access to knowledge.

## **Vision to Cure**

*Care. Connect.  
Create. Cure.*

### **Care for every child.**

Create knowledge across borders. Accelerate the path to cure.

The future of medicine will be built through networks of networks.

Vision to Cure fosters global partnerships that connect expertise, data, innovation, and care to improve outcomes for children worldwide.

*Knowledge should travel, not children.*





This vision is particularly relevant for the Middle East, where ambitious investments in healthcare, genomics, and biomedical innovation are creating new opportunities to improve outcomes for children with rare and complex diseases. We believe that the combination of local clinical excellence and global scientific collaboration can create powerful new models of care for future generations.

More than one thousand years ago, the physician and philosopher Ibn Sina – known in the West as Avicenna – argued that medicine should seek to understand the causes of disease rather than merely describe its manifestations. His ideas travelled across continents and influenced generations of physicians from Central Asia to Europe.

Today, in the era of genomic medicine, this spirit remains as important as ever. Knowledge should travel, not children.

Through scientific collaboration, cutting-edge molecular diagnostics, shared expertise, and trustworthy global partnerships, we can ensure that every child benefits from the best available knowledge – wherever they live. Clinical care should remain local. Knowledge should be global. The future of precision child health will be built not by individual institutions, but by partnerships dedicated to every child, everywhere. MEH

#### About the author

Christoph Klein, MD PhD, is Chair of Pediatrics at the Dr. von Hauner Children's Hospital, Ludwig Maximilian University (LMU) Munich, Germany. A physician-scientist specializing in rare diseases, immunology, and genomic medicine, he and his team have contributed to the discovery of numerous human diseases and the development of novel therapeutic strategies. He is founder of the Care-for-Rare initiative and Director of the Comprehensive Childhood Research Center (CCRC), dedicated to advancing precision medicine and improving outcomes for children worldwide.



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# Multidisciplinary care cuts concussion recovery time by nearly half in children

A randomised clinical trial published in the *British Journal of Sports Medicine* on 26 May 2026 shows that early, symptom-targeted, multidisciplinary treatment more than doubles the odds of full recovery in children with persisting post-concussion symptoms – findings that carry significant implications for how paediatric concussion care is structured and delivered in clinics worldwide.

Concussion is one of the most common reasons children present to hospital following a head injury, yet for around 30% of them, symptoms do not resolve within the expected two-to-four-week window. These children are left navigating a fragmented healthcare system, bouncing between GPs, physiotherapists, and specialists – sometimes waiting weeks between each referral – while their symptoms quietly entrench. A new Australian trial suggests there is a better way, and the lessons it offers are directly applicable to clinical practice far beyond the country's borders.

The Concussion Essentials (CE) trial, led by researchers at the Murdoch Children's Research Institute (MCRI) in Melbourne, evaluated a structured, multidisciplinary intervention for children aged 8 to 18 who were still symptomatic two to three weeks after a concussion. The results were striking. At three months post-injury, 62.5% of children who received the CE intervention had fully recovered, compared with 37% of those receiving standard care – a risk difference of 25.5 percentage points. Secondary outcomes told an equally compelling story: post-treatment symptom severity scores were dramatically lower in the intervention group across all domains, including physical, cognitive, emotional, and sleep and fatigue measures.

## Why this matters beyond Australia

The trial was conducted at a single tertiary paediatric hospital in Melbourne, but

its implications extend well beyond that setting. Persisting post-concussion symptoms (PPCS) are a global challenge, and the fragmented, unimodal approaches that currently characterise care in many health systems – where a child might see a physiotherapist for headaches one week and wait months for psychological support – are precisely the model the CE intervention was designed to replace.

As the authors conclude in the paper: "Individualised, multidisciplinary treatment is associated with accelerated recovery in young people with PPCS. Implementation of such approaches should be considered in routine clinical care of concussion." For clinicians in the Middle East and beyond, that conclusion is a direct challenge to current practice.

MCRI researcher Vanessa Rausa puts it plainly. "While most children recover well after concussion, almost a third continue to experience symptoms that disrupt school, sport and everyday life," she said. "This study shows that if we identify those children early and provide targeted, coordinated care, we can significantly speed up recovery."

## The intervention: one stop, eight weeks

The CE programme was delivered over up to eight weekly one-hour sessions, beginning four weeks post-injury. It was built around three treatment domains: education (psychoeducation, and management of headache, fatigue, sleep, and return to

school and sport), physiotherapy (vestibular, oculomotor, graded exertion, and cervical symptom management), and psychology (a manualised cognitive-behavioural therapy programme focusing on thoughts, feelings, behaviour, stress, and coping).

Crucially, the intervention was not a fixed protocol. Module selection was driven by weekly clinician consensus, previous session content, and the most burdensome presenting symptoms. Children progressed through or between modules depending on how their symptom profile evolved. Concussion education and physiotherapy were prioritised in the first two weeks; psychological support ramped up from weeks four to five, then all modules tapered as children improved. In all, participants received up to 16 modules across the eight sessions.

The 158 participants – 78 in the CE arm, 80 receiving usual care – were recruited between August 2019 and July 2024 from the Royal Children's Hospital emergency department and through community referrals. Their mean age was 13 years; the majority (57.6%) were male. All had been symptomatic at a 14-day post-injury screening and confirmed symptomatic at baseline assessment three weeks after injury.

Primary outcome was full recovery at trial completion, defined conservatively as endorsement of no more than one post-concussive symptom of increased severity compared with pre-injury status on the



Post-Concussion Symptom Inventory, parent version (PCSI-P). The authors were candid about the deliberate rigour of this threshold: using alternative definitions, such as fewer than three symptoms, might have yielded even higher functional recovery rates.

### The child's experience: Macy's story

For families, the difference between standard care and the CE clinic was more than statistical. Macy, 15, sustained a concussion during a school surfing excursion after striking her head on the ocean floor. Though she seemed fine initially, by the following day it was clear something was wrong.

Her mother Jo described the aftermath: "Macy was not herself at all. She was absent minded, emotional, tired and easily overwhelmed, had headaches and kept bumping into things." Three days after the injury, Macy tried to return to school but was overwhelmed by classroom noise and left in tears.

After seeing a GP and being referred to both a sports doctor and a physiotherapist, the family heard about the MCRI concussion clinic. The experience, Jo said, was transformative. "We didn't have to convince the clinic staff of anything, they understood concussion immediately. Macy finally had the practical support she needed, and the team liaised with her school, recommending tailored ad-

justments." Macy's recovery took around five months – longer than hoped – but Jo noted: "The girl who walked into the clinic and the one who walked out were completely different."

### Sex differences and subgroup findings

One notable signal in the data was a differential treatment response by sex. Males and children aged 11 to 12 years appeared to show the greatest benefit from the CE intervention, while recovery rates were lower in females. The study was not powered to formally test sex differences, but the pattern echoes findings from previous literature suggesting that females tend to report greater symptom frequency and severity and are more likely to develop PPCS. As the authors note in the discussion, "there is minimal research examining sex-specific responses to concussion treatment for children and adolescents who experience PPCS," and this remains an important area for future investigation.

Sample retention was high despite the considerable commitment required – 69 of 78 CE participants and 75 of 80 usual care participants completed the trial – which the authors interpret as evidence that the programme was both feasible and acceptable to families.

### Limitations and the road ahead

The trial was conducted at a single, well-resourced tertiary centre, and the authors

are measured about what remains to be done. Strict exclusion criteria – including pre-existing neurological or significant psychiatric conditions – mean that the findings may not immediately generalise to more clinically complex patients. The resource intensity of weekly, face-to-face, multidisciplinary sessions may also present barriers in lower-resource settings or for families in rural and remote areas.

Professor Vicki Anderson, MCRI Theme Director for Clinical Sciences, acknowledged these constraints but argued the findings nonetheless set a clear direction. "Concussion is a growing health concern, with diagnosis and management poorly understood," she said. "Children don't experience concussion in a single way. By bringing education, physiotherapy and psychological care together and tailoring treatment to each child, we can respond to those different needs."

Future work, she said, would focus on whether the model could be delivered through telehealth and scaled to community clinic settings – developments that could substantially extend access for families outside metropolitan centres.

The free Concussion Essentials (Head-Check) app, developed by MCRI in collaboration with the Australian Football League, is one practical step in that direction, offering parents, coaches, and players an accessible tool to identify when medical attention may be needed and to support safe recovery management. MEH

### Journal reference:

Anderson, V., Davies, K., Rausa, V. C., et al. (2026). Multimodal symptom-targeted treatment for young people with persisting post-concussion symptoms: a randomised clinical trial. *British Journal of Sports Medicine*, 60, 856–864. <https://doi.org/10.1136/bjsports-2025-110880>



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In 2019, Evelina London performed DBS on a 2-year-old girl with severe dystonia, then the youngest child in the world to receive DBS, demonstrating our unique expertise in operating safely on very young patients.

## How does deep brain stimulation work?

DBS uses tiny electrodes and a pacemaker-like device to correct abnormal brain signals causing severe movement problems. It is used for complex dystonia and movement disorders when medicines and other treatments haven't been successful.

DBS can reduce painful muscle contractions, improve movement control, and make everyday activities easier. After surgery, the device is adjusted over time, helping the child grow, develop, and take part more fully in daily life.

DBS is a lifelong treatment requiring ongoing stimulation and commitment as children receiving a DBS implant will have this implant throughout their life.

Unfortunately, not all children with movement disorders can benefit from DBS. Our expert clinicians will assess children with all forms of dystonia, (including dyskinetic cerebral palsy), com-



Dr Daniel Lumsden, consultant paediatric neurologist and Clinical Lead for the complex motor disorders service

To date we have assessed approaching 1,000 children, combining cutting edge research with a drive to improve clinical care. It's a privilege to be able to offer deep brain stimulation to children and young people from across the world.

– Dr Daniel Lumsden, consultant paediatric neurologist

plex movement disorders, neurogenetic and metabolic movement disorders (eg. GA1 and other rare conditions) to offer the best intervention and treatment.

## Pioneering use of next-generation devices and outcomes

DBS effectiveness in children shows:

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- pain improvement in ~90% of affected children
- quality of life and functional gains demonstrated across multiple studies.

Robot-assisted stereotactic techniques and intraoperative imaging are used to optimise targeting accuracy in children, supporting safe implantation and better outcomes.

In 2024, Evelina London surgeons im-

planted one of the world's first rechargeable, "sensing" DBS systems in a 14-year-old with cerebral palsy-related dystonia, enabling real-time brain data to guide personalised therapy.

The new deep brain stimulator allows clinicians to track patient's brain rhythms and to tailor electrical impulses to improve patients' movements. In previously implanted devices, the battery would need to be replaced after 4 to 5 years, with further surgery required. The new rechargeable device has unlimited lifespan due to new battery technology.

## International leadership

Evelina London consultants are at the forefront of international research, contributing to major multi-centre studies and guideline-

shaping publications on paediatric DBS safety, complications and outcomes positioning us as a global centre of excellence.

With a highly successful clinical and research portfolio, our consultants lead and contribute to numerous national, European and international multicentre studies to advance care in this field.

Dr Daniel Lumsden, consultant paediatric neurologist and Clinical Lead for the complex motor disorders service, is recognised as an international expert in childhood dystonia.

"It is a privilege to be in the position to offer deep brain stimulation to children and young people in the UK and beyond. To date we have assessed approaching 1,000 children, combining cutting edge research with a drive to improve clinical care. The goals of children and their families remain at the centre of our pathway, focusing on a better future through improved motor control," says Dr Lumsden.

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# Fathers in the frame: brief nursery videos boost new dads' infant safety knowledge

A pilot study published in *Pediatrics Open Science* suggests that showing short educational videos to first-time fathers in the hospital newborn nursery – a setting that uniquely captures paternal presence – can meaningfully improve knowledge of safe sleep, infant crying, and car safety. The findings point to an underused clinical window with real implications for infant injury prevention and the redistribution of parental caregiving burden.



Healthcare systems have historically organised postnatal education around the mother–infant relationship, leaving fathers to absorb what they can by proximity. A new pilot study from Ann & Robert H. Lurie Children’s Hospital of Chicago and Northwestern University Feinberg School of Medicine suggests this represents a missed opportunity – and that it can be corrected with something as straightforward as a short video on a smartphone or tablet, shown while a new father sits beside his partner in the nursery.

The study, published in *Pediatrics Open Science* in 2026, enrolled 167 first-time fathers of full-term infants and asked them to watch brief educational videos on three topics linked to infant mortality: safe sleep, infant crying, and car safety. The results were encouraging, if nuanced: knowledge improved significantly in the immediate post-viewing period, though gains proved difficult to sustain once families returned home.

## Why fathers, and why now?

The clinical rationale for targeting fathers specifically is well established, even if practice has been slow to follow. Father engagement in early parenting is associated with improved childhood behavioural and educational outcomes, reduced mater-

nal burden, and stronger family functioning. Yet fathers routinely report feeling like bystanders – or, as one study cited by the authors characterised it, “a practical guy in the shadow” – in healthcare settings focused on the birthing parent.

The stakes in terms of infant safety are considerable. Unintentional injuries related to unsafe sleep, frustration-driven responses to infant crying, and improper car seat use remain leading causes of death in young children. Crucially, fathers represent the majority of known perpetrators in child-inflicted injury – a statistic that, rather than casting fathers as a risk to be managed, underscores the urgency of engaging them as informed caregivers from the outset.

“New fathers often report feeling like bystanders in healthcare settings, with parenting supports primarily focused on the mother from pregnancy through the postpartum,” said Mikaela Thompson from Northwestern University Feinberg School of Medicine, who led the study. “Our study recognises the importance of involving fathers in child health, and especially in infant injury prevention, from the very beginning of becoming a father.”

For clinicians, the implication is direct: the newborn nursery constitutes a feasible, and largely untapped, venue for father-

cused education that does not require separate infrastructure or extensive resource investment.

## The intervention and how it worked

The study was conducted in the newborn nursery of a large Midwestern hospital between June and December 2023. Eligible participants were English-speaking, first-time fathers of full-term infants – those with infants in the neonatal intensive care unit were excluded. Of 367 birthing families approached, 167 fathers enrolled, exceeding the recruitment target of 150 and demonstrating that in-hospital recruitment is operationally viable.

Each participant completed an initial survey before watching three videos, each running four to seven minutes. The videos – developed specifically for this intervention – featured a real father interacting with his two-week-old infant, with educational content delivered by a paediatrician or childhood injury-prevention expert. Topics were chosen on the basis of being common parental knowledge gaps and successful targets of previous maternal education programmes.

Knowledge surveys were administered before and immediately after the videos, then again at one week and one month post-dis-

charge. Incentives included a pack of nappies at enrolment and a \$30 electronic gift card on completing the final survey.

Retention was strong: 97% of enrolled fathers completed the initial survey, 86% watched all three videos and completed the post-video survey, and 83% of baseline survey completers finished the one-month follow-up – a meaningful achievement for a community that is notoriously difficult to retain in research.

### What the data showed

The video intervention produced statistically significant improvements in safe sleep knowledge immediately following viewing. Selection of unsafe sleep locations fell sharply: endorsement of car seats as a sleep location dropped from 28.7% to 8.4%, and swing or rocker from 20.3% to 3.5%. Knowledge about placing infants on their back to sleep was already high at baseline (98%) and remained so.

Crying knowledge also improved substantially. Pre-video, only 55% of fathers correctly understood that infant crying does not always have an identifiable cause, and 77% correctly identified late afternoon or evening as the peak crying period. Post-intervention, those figures rose to 78% and 97% respectively. Importantly, crying knowledge showed greater durability than sleep knowledge at follow-up, with fathers remaining more than twice as likely to answer correctly at both one week and one month.

Car safety knowledge was strikingly high at baseline and remained so throughout – near-universal endorsement of rear-facing car seat use and no fathers leaving infants unattended in vehicles at any time point. The authors attribute this partly to the study's demographic composition: the sample was predominantly white, highly educated (92% with at least a college degree), married, and privately insured. These characteristics are associated with higher baseline safety knowledge and compliant behaviours, limiting how much the intervention could move the needle in this domain.

The less encouraging finding was that safe sleep gains did not hold at home. By one

month post-discharge, adherence to infants sleeping alone in their crib had dropped to 79%, and car seat use as a sleep location – something the video explicitly discouraged – had paradoxically risen, with 38.1% of fathers endorsing it at one month compared with 8.4% immediately post-video.

### The knowledge-behaviour gap

This divergence between what fathers knew and what they did is perhaps the most clinically significant finding in the paper. As the authors note in the discussion, “factors such as time of day and fatigue may influence adherence” – a thoroughly plausible explanation for any parent navigating the sleep-deprived reality of the fourth trimester. Co-sleeping and the use of inclined sleepers often emerge not from ignorance but from exhaustion, which no amount of pre-discharge video instruction fully inoculates against.

“Our finding suggests that at-home reinforcement or ‘booster sessions’ might be needed to maintain learning and support behaviours, especially in the first year,” said Craig Garfield, MD, senior author and Professor of Paediatrics and Medical Social Sciences at Northwestern University Feinberg School of Medicine. “Text messaging might help support study retention.”

The authors draw on existing evidence for this approach: repeated messaging has demonstrated effectiveness in father-focused interventions, and booster doses of education at well-child visits or via digital platforms represent a realistic, scalable extension of the nursery intervention. As the authors write in their conclusion, “fathers may benefit from additional provision of ‘booster’ information once home to sustain knowledge and promote concordant behaviours.”

### Implications for practice and the road ahead

“The videos in our study on key injury prevention topics are a novel educational intervention soon after infant birth that offers unique opportunities to reach fathers who may not be able to come to infant healthcare visits,” explained Dr Garfield.

New fathers often report feeling like bystanders in healthcare settings, with parenting supports primarily focused on the mother from pregnancy through the postpartum.

“We show that the newborn nursery is indeed a viable setting for father-focused instruction – fathers may actually be looking for this sort of information at this time.”

The study's limitations are acknowledged by the team. It was a single-site, single-arm design without a control group, which precludes causal inference. The homogenous sample reduces generalisability, particularly to populations in which baseline infant safety knowledge and resources are lower – precisely the groups where an effective intervention would have the greatest impact. The one-month follow-up window, while pragmatic for a feasibility study, does not capture how knowledge and behaviours evolve across the first year of parenting, when crying peaks around four to six weeks and fatigue compounds risk.

The authors propose a clear agenda for future work: expanding the intervention to NICU settings and well-child visits, using text messaging to support knowledge retention, and critically, recruiting more socioeconomically and racially varied populations.

“Relying solely on mothers to keep infants safe overlooks the important role of fathers and a key opportunity for prevention,” the authors write – a statement that is as much a call to clinical practice as it is a research conclusion.

For health systems willing to act on these findings, the barrier to entry is low. The videos are brief, evidence-based, and already developed. The setting – the newborn nursery – is one in which fathers are naturally present. What has been lacking, until now, is evidence that they are both willing and able to engage. This study provides it. MEH

#### Journal reference:

Thompson, M., O'Sullivan, K., Simon, C., et al. (2026). Discharge for dads: a video-based pilot intervention in the nursery supporting first-time fathers. *Pediatrics Open Science*, 2(2). <https://doi.org/10.1542/pedsos.2025-001195>



# Great Ormond Street Hospital: Continuing to lead the future of gene therapy for children

## Transforming possibility in paediatric medicine

For families facing rare genetic disorders, and for clinicians seeking options where conventional treatments have reached their limits, gene therapy is redefining what is possible in paediatric healthcare. At the forefront of this transformation is Great Ormond Street Hospital for Children (GOSH), a globally recognised leader in paediatric healthcare, research and innovation based in London, United Kingdom.

### 25 years of pioneering innovation

This year marks 25 years since GOSH helped pioneer gene therapy, laying the foundations for treatments that are now changing, and saving, young lives. Working with international partners, GOSH has led advances in delivery systems, particularly viral vectors, enabling safer and more effective treatment of conditions once considered incurable, including severe immune deficiencies, degenerative muscle disorders and inherited blindness.

Since delivering its first gene therapy in 2001, GOSH has translated scientific discovery into clinical practice at scale. More than 90 therapies have been developed through its Cell and Gene Therapy Facility, with 35 gene and cell therapies delivered through clinical trials. To date, over 135 children have received gene therapy at GOSH, alongside nearly 100 patients treated with advanced cell therapies.

### Global recognition for breakthrough science



In 2026, this leadership was further recognised when GOSH clinician Professor Wasim Qasim and patient Alyssa Tapley were named in TIME's prestigious TIME100 Health list. Their inclusion reflects a world-

first breakthrough in base editing technology, developed and delivered at GOSH.

Alyssa, who had an otherwise untreatable form of T-cell leukaemia, became the first patient to receive this pioneering therapy, in which DNA within immune cells is precisely rewritten to target and eliminate cancer. Now in sustained remission for over three years, her story demonstrates both the clinical impact of this innovation and GOSH's capability to safely deliver highly complex, next-generation therapies. In 2025/26 this included 67 phase 1 and 2 clinical trials of experimental medicines, and 9 world-first, in man or child treatments.

### Delivering measurable outcomes for children

Gene therapy at GOSH is already transforming outcomes, enabling children to attend school, live independently and achieve key developmental milestones. The hospital has also contributed to the development of globally significant therapies, including treatment for spinal muscular atrophy, where early intervention is critical to improving long-term outcomes.

### Driving the next generation of therapies

Innovation continues at pace through GOSH's partnership with University College London, most visible in the Zayed Centre for Research into Rare Disease in Children. This integrated model, bringing clinicians, scientists, academics and patients together, accelerates the translation of discovery into clinical care. Advances in genomics, cell therapy and precision medicine are rapidly expanding treatment options for children with the most complex conditions.

### A trusted global partner

GOSH works in partnership with health-

care providers worldwide, including across the Middle East, to strengthen paediatric services and improve outcomes closer to home. Through visiting consultant programmes, fellowships to London, education programmes and clinical collaborations, the hospital supports capability-building while maintaining access to highly specialised care in London.

Great Ormond Street Hospital is one of the world's leading specialist children's hospitals, delivering care across 67 specialties and sub-specialties. Each year, it receives around 260,000 visits from patients, including more than 6,000 visits to its dedicated International and Private Care service.

At the core of GOSH's model is its multidisciplinary team approach, ensuring that children with rare and complex conditions benefit from coordinated, world-leading expertise. This supports robust clinical decision-making and consistently strong outcomes, underpinned by a commitment to transparency. GOSH publishes more patient-reported outcome measures (PROMs) data than any other paediatric hospital globally.

Care is personalised to each child, with dedicated international teams providing families with seamless support from referral through to discharge.

With a proven track record of innovation, rigorous outcomes measurement and a commitment to excellence, GOSH delivers world-leading care for the most complex paediatric conditions, consistently achieving results that set international benchmarks. MEH

For more information or to refer a patient:

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## SJD and Clínic have performed Europe's first operation on a foetus whose entire intestine had developed outside its body

The medical team at SJD Barcelona Children's Hospital and Hospital Clínic Barcelona decided to perform foetal surgery at 28 weeks' gestation to prevent irreversible damage to the baby.

A team comprising specialists from BCNatal – a consortium specialising in maternal-foetal medicine and neonatology comprising SJD Barcelona Children's Hospital and Hospital Clínic Barcelona – and specialists in paediatric surgery and anaesthesiology from SJD Hospital has, for the first time in Europe, operated on a foetus which, due to a severe malformation, **had developed its entire intestine outside its body**. The baby, who underwent surgery in the womb during the 28th week of gestation, was born six weeks later and is currently feeding normally.

The foetus had **gastroschisis**, a congenital malformation in which the baby's intestines (and sometimes other organs) develop outside the body through an opening in the abdominal wall, located to the right of the umbilical cord, which does not close properly during pregnancy. As they are unprotected, the intestines are exposed to amniotic fluid, become inflamed, lose blood supply and may suffer necrosis, with very serious consequences for the baby after birth.

The healthcare professionals monitoring the pregnancy of the mother, a Co-

lombian 20-year-old woman, detected the foetal malformation during a routine ultrasound scan in the 20th week of gestation and referred her to BCNatal, a leading centre in obstetrics and foetal medicine. After evaluating the various options and consulting the case with the ethics committee, the medical team treating the expectant mother proposed a foetal surgery that has so far been performed only on very rare occasions in Colombia and the United States, but never in Europe.

### A successful operation

The foetal surgery took place on 10 February, lasted two and a half hours and was carried out by a team comprising specialists in foetal medicine and surgery, paediatric surgery, anaesthesiology and neonatology.

The surgeons made an incision in the mother's abdomen to access the uterus; they then repositioned the foetus to allow access to its abdomen and performed the procedure **laparoscopically**. To do this, they inserted four trocars into the amniotic sac and, after draining the fluid and introducing gas to create space within the

abdomen that would allow them to see and operate safely, they carefully repositioned the intestine within the abdominal wall. Upon completion, they closed the incision in the abdomen. This is a procedure that requires a high degree of precision, given that the **foetus weighed 700 grams**, the intestine was 80 centimetres long and had a diameter of 3 to 15 mm, and had to be reinserted through a puncture measuring just 1.5 centimetres.

In the days following the procedure, ultrasound scans confirmed that the inflammation in the intestine was subsiding and that it was returning to its normal appearance. The pregnancy continued and **the baby was delivered by caesarean section** at 34 weeks' gestation. Although the baby was underweight for its gestational age, **the outcome was very favourable** and, after a short stay in hospital, the baby was discharged.

Gastroschisis occurs in between 2 and 3 out of every 10,000 births (which translates to 120 cases annually in Spain and 2,400 in Europe), but foetal surgery would only be indicated in 10% of these cases. MEH



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## Blood test could transform diagnosis of childhood IBD

A four-protein serum panel outperforms standard inflammatory markers in distinguishing IBD from non-IBD and differentiating Crohn's disease from ulcerative colitis.

Researchers at Beth Israel Deaconess Medical Center (BIDMC) and Mass General Brigham for Children have identified a blood-based protein signature capable of diagnosing inflammatory bowel disease (IBD) in children with clinically meaningful accuracy, potentially reducing dependence on invasive endoscopic procedures.

Published in *eBioMedicine* on 29 May 2026, the case-control study applied the SomaScan aptamer proteomics platform to serum samples from 47 paediatric patients, measuring 1,305 proteins simultaneously. This yielded 95 proteins differentially expressed in IBD versus non-IBD controls, and 70 distinguishing ulcerative colitis

(UC) from Crohn's disease (CD). Machine learning then narrowed these to an eight-protein classifier achieving an AUC of 0.95 for IBD identification.

### Validation across two independent cohorts

Four proteins – MMP1, MMP3, resistin, and haptoglobin – were validated by ELISA across 295 and then 105 paediatric patients, achieving AUCs of 0.86 and 0.90 respectively, outperforming both CRP (AUC 0.70) and ESR (AUC 0.74). A separate four-protein panel distinguished UC from CD with an AUC of 0.93.

Biomarker levels remained significantly

elevated regardless of treatment status, and both resistin and haptoglobin tracked disease activity, suggesting utility for monitoring remission and flares.

Senior author Towia Libermann noted that the findings demonstrate “the utility of blood proteomics in identifying disease-specific biomarkers and new non-invasive tests for differential diagnosis in paediatric IBD.” Co-senior author Harland Winter cautioned that whilst promising, these tools “are not yet at the point of replacing standard clinical and pathologic data.”

Prospective validation in larger, more ethnically diverse cohorts is now warranted before clinical implementation. MEN

#### Reference:

Omede, M., Otu, H. H., Grossberg, L. B., et al. (2026). Serum proteomics in paediatric inflammatory bowel disease from a case-control study: biomarker discovery and ulcerative colitis–Crohn's disease differentiation. *eBioMedicine*, 128, 106311. <https://doi.org/10.1016/j.ebiom.2026.106311>

## Dexmedetomidine in the PICU: sedative choice shapes children's cognitive future

RESTORE-Cognition study links opioid-benzodiazepine-only regimens to lower IQ scores years after critical illness.

The specific sedatives used to manage critically ill young children on mechanical ventilation may have measurable consequences for their long-term neurocognitive development, according to a prospective cohort study published in *JAMA Network Open* on 19 May 2026.

The RESTORE-Cognition study followed 256 children aged eight years or younger who had been admitted to a paediatric intensive care unit (PICU) for acute respiratory failure. Neurocognitive testing – covering IQ, memory, attention, and visuospatial skills – was conducted a median of 5.3 years after discharge. Overall, the cohort's mean estimated IQ of 100.3 was reassuringly close to the population norm of 100. However, after adjusting for socioeconomic status, illness

severity, and duration of mechanical ventilation, children who received only opioids and benzodiazepines scored 4.1 IQ points lower than those whose regimen included dexmedetomidine. In the highest benzodiazepine dose tertile, that gap widened to nearly 8 points.

### Subtle deficits across multiple domains

Beyond global IQ, the entire survivor cohort performed below age-based norms on nonverbal memory, visuospatial skills, fine motor control, and attention – domains with practical relevance to academic performance and daily functioning.

### A call to revisit sedation protocols

Lead investigator Martha A.Q. Curley of

the University of Pennsylvania School of Nursing noted: “Our study shows that the choice we make in the paediatric ICU can affect a child's brain development years later. Specifically, adding dexmedetomidine to our treatment plan may help protect a child's long-term thinking and learning skills better than using opioids and benzodiazepines alone.”

Current paediatric critical care guidelines already suggest  $\alpha$ -agonists such as dexmedetomidine as a preferred sedative class; these findings lend clinical weight to that recommendation, particularly in younger patients. The authors acknowledge that causality cannot be confirmed in an observational design and call for a prospective randomised trial. MEN

#### Reference:

Curley, M. A. Q., Beers, S. R., Asaro, L. A., et al. (2026). Sedative choice and neurocognitive outcomes after critical illness in early childhood. *JAMA Network Open*, 9(5). <https://doi.org/10.1001/jamanetworkopen.2026.13599>

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# Saline vs balanced crystalloid in paediatric septic shock: the debate is finally over

A landmark multinational trial has confirmed that two widely used IV fluids perform identically when resuscitating children in septic shock – a finding that should simplify clinical decision-making worldwide.

Septic shock, in which the body's response to infection drives organ failure, is a paediatric emergency requiring prompt fluid resuscitation. For years, clinicians have debated whether balanced crystalloid fluid – formulated to mimic blood composition – offers advantages over standard 0.9% saline, particularly regarding renal outcomes. Smaller studies produced conflicting results, leaving practice patterns inconsistent across centres.

## No difference in kidney outcomes at 30 days

The SMART-PEDS trial, published in

the *New England Journal of Medicine* on 5 June 2026, enrolled more than 9,000 children aged 2 months to under 18 years across 47 paediatric emergency departments in five countries. Investigators found no difference between fluids in major adverse kidney events or persistent kidney dysfunction at 30 days.

Co-author Dr Elizabeth Alpern of Ann & Robert H. Lurie Children's Hospital, Chicago, said the study provides “a definitive answer that there is no additional benefit or harm from using one type of IV fluid over another for septic shock resus-

citation in children,” adding that “centres around the world can now confidently use whichever of these IV fluids is readily available.”

## Community engagement shaped the trial design

Notably, because standard informed consent is often impractical in emergency settings, the research team conducted extensive community consultation before the trial launched, including focus groups with high-risk patient families and input from patient and family advisory boards. MEH

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### Reference:

Fran Balamuth, Scott L. Weiss, Elliot Long, *et al.* (2026). Balanced crystalloid versus saline for septic shock in children. *New England Journal of Medicine*. <https://doi.org/10.1056/NEJMoa2601969>

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# Bedside light probe spots deadly gut disease in premature babies before x-ray can

A handheld optical device could transform early detection of necrotizing enterocolitis in neonatal intensive care units.

A noninvasive handheld probe that bounces infrared light off a premature infant's abdomen can reliably detect necrotizing enterocolitis (NEC) at earlier stages than conventional x-ray, according to a first-in-human study published in the *Journal of Pediatric Surgery*.

NEC is an acute, rapidly progressive intestinal disease that strikes premature neonates without warning. Caught early, it responds to antibiotics; left undetected, it frequently demands surgery and carries significant mortality. The absence of a reliable early-detection method has long frustrated neonatologists and paediatric surgeons alike.

## How the technology works

The broadband optical spectroscopy (BOS) device, developed collaboratively by clinicians at Ann & Robert H. Lurie Children's Hospital of Chicago and Vadim Backman's biomedical engineering laboratory at Northwestern University, detects subtle colour changes in intestinal tissue – changes surgeons associate with threatened perfusion in NEC – without radiation or discomfort to the infant.

In a cohort of 96 premature infants under 36 weeks' gestation, BOS produced a clear signal within two minutes. “Our new handheld device reliably distinguish-

es NEC from healthy tissue within two minutes, and it can be used at the bedside without subjecting these fragile babies to any pain or radiation,” said senior author Seth Goldstein, MD, MPhil.

## Implications for clinical practice

If validated in larger trials, BOS could enable bedside NEC screening as a routine component of neonatal intensive care, potentially shifting treatment decisions upstream of radiological confirmation and reducing the rate of surgical intervention. MEH

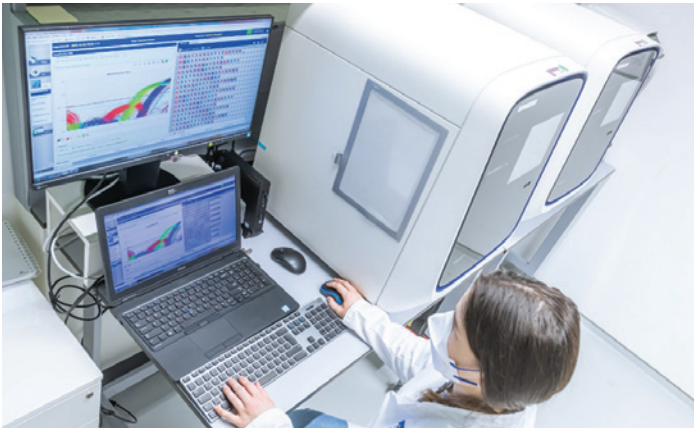
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### Reference:

Dodd, A., Goldstein, S., & *et al.* (2026). First-in-human pilot study of broadband optical spectroscopy (BOS) as noninvasive surveillance for necrotizing enterocolitis (NEC). *Journal of Pediatric Surgery*. <https://doi.org/10.1016/j.jpedsurg.2026.162978>

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# HEIDELBERG UNIVERSITY HOSPITAL

## Newborn screening – for our children, for a better life

### Overview

More than six hundred years ago, the first German university was founded in Heidelberg. Today, innovative and effective diagnosis and therapy for all complex diseases is guaranteed by world-renowned physicians, state-of-the-art equipment, as well as the proximity and interlinking of the more than 50 specialist departments of Heidelberg University Hospital. Research ensures continuous progress and the most up-to-date patient care. In 2026, the hospital ranks 12th in the global “World’s Best Hospitals” ranking and is one of the leading medical centers in Europe.

### Newborn screening

Caring for sick children has always been of great importance in Heidelberg. To lay the foundation for the healthiest possible life right from the start, Heidelberg University Hospital has developed and continuously optimized a comprehensive newborn screening program. The Newborn Screening Center Heidelberg has accumulated experience in newborn screening by investigating more than 5.0 million neonates up to now. It is part of the Center for Child and Adolescent Medicine at Heidelberg University Hospital.

### Congenital metabolic, hormonal, haematological, immune and neuromuscular disorders

Most children are born healthy. However, there are diseases that exhibit no external signs in newborns. If left untreated, rare congenital metabolic diseases, hormonal, haematological, immune and neuromus-

cular disorders may lead to organ damage, physical or mental impairment, severe infections or even death. In most cases, early detection of these diseases allows to prevent or alleviate the consequences by taking medication, following a diet or implementing other specific measures. The screening procedure is ideally performed on the second or third day of life, by taking a few drops of blood and placing them on a filter paper card, which is subsequently sent to the newborn screening laboratory.

The list of screened diseases includes 13 metabolic disorders, two hormonal disorders, severe combined immunodeficiency (SCID), the sickle cell disease (SCD) and spinal muscular atrophy (SMA), vitamin B12 deficiency and related disorders (homocystinuria, propionic acidemia and methylmalonic acidurias). In total, one in 600 newborns is affected by one of these diseases.

### Cystic fibrosis

Along with the described newborn screening, there is the option to test for cystic fibrosis, performed on the same blood sample. Cystic

fibrosis is a hereditary disease that affects approximately one in 5,000 children. Affected children develop viscous mucus in their lungs and other organs. This leads to permanent inflammation. The aim of this examination is the early diagnosis of cystic fibrosis so that treatment can be initiated as soon as possible, thus improving the quality of life and life expectancy of the children.

### Newborn screening is not just a laboratory test; it is a comprehensive program!

Additional disorders detected by stand-alone methods are classical galactosemia, biotinidase deficiency, congenital primary hypothyroidism and congenital adrenal hyperplasia. The application of tandem mass spectrometry (MS/MS) in newborn screening enables to identify about 16 medically relevant and treatable metabolic disorders in addition to phenylketonuria (PKU).

### Contact

for international patients and healthcare facilities:

Heidelberg University Hospital  
Medical International Office

[international.office@med.uni-heidelberg.de](mailto:international.office@med.uni-heidelberg.de)  
[www.heidelberg-university-hospital.com](http://www.heidelberg-university-hospital.com) 



#### Newborn Screening Center Heidelberg

To ensure that many families can benefit from these and other examinations, the Newborn Screening Center Heidelberg offers healthcare facilities in other countries the opportunity to send in samples for testing.

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# Connecting Innovators Across Every Pillar Of The Global Healthcare Ecosystem





# Boston Children's Hospital: An international leader in gene therapy

Boston Children's Hospital is home to one of the largest pediatric gene therapy programs in the world, driven by clinical expertise and pioneering research in emerging gene therapies, particularly for rare and difficult-to-treat conditions. Those conditions include hereditary hearing loss, which has been a recent area of innovation at Boston Children's.

## Gene therapy for hereditary hearing loss: Research in action

Up to 60 percent of children born with hearing loss have an identifiable genetic cause. To date, mutations in at least 150 genes have been implicated in hearing loss. Each disrupts hearing differently. If gene therapy is done early, in the first one to four years of life, children can acquire normal spoken language and connect better with others socially.

In May 2025, a young boy received an injection delivering a healthy copy of a gene called *OTOF* into the cochlea of his inner ear – one of the first patients with hereditary hearing loss to receive gene therapy at Boston Children's. The treatment is just the first in a pipeline of gene therapies for hearing loss. The team hopes to advance several other gene therapies to clinical trials over the next decade.

For example, Boston Children's is currently developing other types of gene therapy for hearing loss and is in discussions with potential industry partners to move these therapies into clinical trials.

Such advances lead to one crucial outcome: improvements in patient care.

"How we discuss hearing loss with our patients and families is different even from two years ago," says Boston Children's otolaryngologist Eliot Shearer, MD, PhD. "There are now more options to inform our decisions."

## Gene therapy at Boston Children's Hospital

What makes Boston Children's Gene Therapy Program unique is its dedicated infrastructure. The core team collaborates closely with disease experts at two



of the world's leading academic medical institutions – Boston Children's Hospital and Dana-Farber Cancer Institute. An efficient enrollment process allows children to move smoothly and quickly from study enrollment to treatment. We also offer a one-of-a-kind satellite training module to support referring physicians.

The program works closely with Boston Children's specialists in ophthalmology, otolaryngology and communication enhancement, neurology, neurosurgery, pulmonary medicine, genetics and genomics, and metabolism, as well as academic and pharmaceutical partners in the U.S. and abroad. We are a founding member of the Transatlantic Gene Therapy Consortium, which seeks to combine the expertise from a number of centers treating rare diseases with different platforms.

In addition, our Gene Therapy Program offers patients and referring providers:

- **Multidisciplinary expertise:** Integrated care across specialties
- **Access to cutting-edge therapies:** Participation in national and international clinical trials on gene therapy
- **Coordinated experience for families and physicians:** Dedicated international coordinators streamline referrals, scheduling, and ongoing communication

We currently offer gene therapy for these conditions or plan to in the near future:

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# World-class paediatric epilepsy surgery in Zurich



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For families seeking a second opinion or advanced treatment, Zurich offers internationally recognised expertise, advanced diagnostics, surgical technology, and compassionate paediatric care in one specialised centre, with the child and family at the centre of every decision. **MEH**

## How to find the University Children's Hospital Zurich

Send medical documents in English and, if available, imaging files to [international@kispi.uzh.ch](mailto:international@kispi.uzh.ch) or call +41 44 249 28 28.

- You will receive a specialist assessment and a transparent overview of costs.
- The International Office provides support with visas, travel, and accommodation.
- An experienced team will welcome you on site, plan your treatment individually, and support you throughout your stay.



When a child has severe epilepsy, families need more than treatment: they need a clear diagnosis, an expert second opinion, and a team offering the full spectrum of modern care. The University Children's Hospital Zurich is Switzerland's largest children's hospital and one of Europe's leading centres for specialised paediatric care. In our new hospital, children and families are cared for in a calm, family-centred environment designed around safety, comfort, and recovery.

Our paediatric epilepsy programme is the largest in Switzerland and among the largest in Europe. Care is provided by internationally recognised paediatric epilepsy experts who lead international ILAE surveys, develop consensus statements and clinical guidelines, and conduct benchmark studies in paediatric epilepsy surgery. This international leadership is brought directly to each child's diagnostic evaluation, treatment planning, and long-term care.

We provide comprehensive care for infants, children, and adolescents with difficult-to-treat epilepsy, developmental and epileptic encephalopathies, and complex structural brain disorders. Families from the Middle East have access to a specialised multidisciplinary team, including paediatric epileptologists, neuropsychologists, neuroradiologists, neurosurgeons, intensive care specialists, rehabilitation experts, specialised nurses, and international patient coordinators.

## Early evaluation and advanced diagnostics

Epilepsy surgery is no longer considered a last resort. For carefully selected children with focal structural epilepsy, surgery can offer sustained seizure freedom, reduce antiseizure medication burden, and improve development, behaviour, learning, and quality of life. Early referral is important: if seizures continue despite two appropriate antiseizure medications, or if a child has a clearly defined lesion in a surgically accessible brain area, expert presurgical evaluation should be considered without delay. Young children, including infants,

can also benefit from early assessment in experienced paediatric centres.

In Zurich, we provide the full spectrum of modern paediatric presurgical evaluation: high-resolution epilepsy MRI, long-term video-EEG monitoring, advanced EEG analysis, PET, functional imaging, neuropsychological and developmental assessment, genetic evaluation, and multidisciplinary case review. When non-invasive tests are not sufficient, we offer invasive monitoring with stereoelectroencephalography (SEEG), using an individually tailored strategy to define the seizure onset zone while preserving critical functions such as language, motor function, and vision.

## Personalised surgical treatment

Our surgical expertise covers the full range of modern paediatric epilepsy surgery. Depending on the child's diagnosis, this may include focal resections, lesionectomies, temporal and extratemporal surgery, multilobar surgery, hemispherotomy, corpus callosotomy, disconnection procedures, and minimally invasive approaches such as SEEG-guided radiofrequency thermocoagulation and laser ablation in selected cases. We treat focal cortical dysplasia, low-grade epilepsy-associated tumours, hypothalamic hamartoma, hemimegalencephaly, polymicrogyria, Sturge-Weber syndrome, tuberous sclerosis complex, Rasmussen encephalitis, vascular lesions, and MRI-negative epilepsy.

Every recommendation is personalised and discussed with parents in clear language. Referral for presurgical evaluation does not mean that surgery is inevitable; it means that the child's epilepsy is analysed in depth so that the safest treatment pathway can be identified. When surgery is appropriate, the goal is not only seizure control, but also to support cognitive development, independence, schooling, and family life.

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# Largest-ever normative model of brain white matter charts neural change from childhood to old age

Researchers have pooled diffusion MRI data from more than 54,000 people across 19 international datasets to produce the most comprehensive normative model of the brain's white matter ever created. Published in *Nature Communications* on 27 May 2026, the work establishes lifespan centile curves for key measures of brain microstructure – offering clinicians and trialists a sensitive new tool for detecting disease-related changes at the individual level.

When a paediatrician plots a child's height on a growth chart, they are asking a deceptively simple question: is this person developing as expected for their age and sex? A landmark study from the USC Mark and Mary Stevens Neuroimaging and Informatics Institute (Stevens INI) at the Keck School of Medicine of USC has now applied the same logic to the brain itself – specifically to the vast network of white matter fibres that wire its regions together. The result is a lifespan normative model of brain microstructure with direct implications for the diagnosis and monitoring of Alzheimer's disease, schizophrenia, and a wide range of other neurological and psychiatric conditions.

The clinical significance is hard to overstate. Traditional case-control neuroimaging studies compare group averages, which can obscure the substantial variation that exists between individuals carrying the same diagnosis. This new framework sidesteps that limitation. As the authors write in their paper, normative modelling “yields individual profiles of anomalies, which are agnostic to the clinical labels and accommodate the well-supported premise that not all individuals with the same disease deviate in the same brain regions and in the same direction.” In practice, that means clinicians and researchers can now ask not merely whether a patient's group differs from controls, but precisely where – and by how much – that individual's brain wiring departs from what would be expected for someone of their age and sex.



Statistical charts compiled from a large population allow brain abnormalities to be detected in new individuals.

## Building the atlas

White matter is the brain's cabling system – dense bundles of myelinated axons that carry signals between cortical and subcortical regions. It is exquisitely sensitive to ageing and disease, yet until now there has been no large-scale normative reference for its microstructure comparable to those already available for brain volume and cortical thickness.

The Stevens INI team addressed that gap by aggregating diffusion MRI (dMRI) data from 54,583 individuals aged 4 to 91 years, drawn from 19 publicly available international datasets spanning cohorts from the United States, the United Kingdom, the Netherlands, Australia, China, Cuba and beyond. Using diffusion tensor imaging (DTI), they extracted four widely used

metrics – fractional anisotropy (FA), mean diffusivity (MD), axial diffusivity (AD), and radial diffusivity (RD) – across 21 major deep white matter regions plus a global white matter skeleton measure, yielding 22 regions of interest in total.

The statistical backbone of the model is hierarchical Bayesian regression (HBR), a method specifically designed to handle the thorny problem of multi-site neuroimaging data, where scanner type, field strength, voxel size, and diffusion-weighting protocols all introduce systematic differences between cohorts. By treating acquisition protocol as a batch effect within the HBR framework, the team could pool data across 37 distinct dMRI protocols without inadvertently stripping out genuine biological variance – a persistent pit-

fall of simpler harmonisation approaches such as ComBat.

“Just as paediatric growth charts help clinicians determine whether a child’s height or weight is developing as expected, these brain charts provide a reference for how the brain’s neural pathways typically change over the lifespan,” said Julio E. Villalón-Reina, MD, PhD, a postdoctoral researcher at the Stevens INI and the study’s first author. “That gives us a powerful new way to identify when an individual’s brain wiring falls outside the expected range.”

### Trajectories across the lifespan

The resulting centile curves – running from the 2nd to the 98th percentile – paint a detailed picture of how white matter evolves from early childhood through to the ninth decade of life. FA, a marker of fibre organisation and myelination, follows an inverted U-shaped trajectory, rising during maturation and declining after a peak. The three diffusivity measures follow the reverse: a U-shaped pattern, falling as the brain matures and rising again in older age as microstructural integrity wanes.

Critically, the timing differs substantially between metrics and between regions. On average, FA peaked earliest (around age 29 for the global white matter skeleton), followed by RD (minimum at 37 years), MD (minimum at 43 years), and AD (minimum at 53 years). Among individual tracts, FA peaked as early as 16 years in the genu of the corpus callosum and as late as 39 years in the fornix. “Brain development and brain ageing are not uniform processes,” Villalón-Reina noted. “The brain’s neural pathways mature on distinct timelines, and some are more vulnerable to decline than others. Our model reveals this structure by merging data on a truly global scale.”

### The ‘last in, first out’ principle

One of the more striking ancillary findings concerns an old theoretical question in neuroscience: does the brain age in the reverse order of how it developed? This retrogenesis hypothesis – sometimes called ‘last in, first out’ – predicts that white mat-

ter tracts that mature late in development should be among the first to degenerate in old age, because they are less robustly myelinated and therefore more vulnerable.

Using the centile curves to measure percentage change in DTI metrics at different life stages, the researchers found significant support for the hypothesis for FA, MD, and AD – but not for RD. Tracts with a later age of peak maturation showed faster percentage change in the oldest age bands (75–91 years), consistent with a developmental origin for individual vulnerability to age-related white matter decline. The team did not find support for a related but distinct idea, the ‘gain-predicts-loss’ hypothesis, which predicts that the rate of maturation and the rate of degeneration should be directly correlated.

### Detecting disease in individuals

The model’s practical value was tested in three clinical datasets. In participants with mild cognitive impairment (MCI) and Alzheimer’s dementia from the ADNI3 and OASIS3 cohorts, the normative framework identified atypical white matter patterns concentrated in the cingulum of the hippocampus (CGH) and the splenium of the corpus callosum (SCC) – regions involved in memory and long-range cortical communication. For dementia, the strongest discriminative performance was seen for radial diffusivity in the CGH, with 37% of dementia patients showing extreme positive deviations in that tract. MCI showed more modest but still significant deviations – expected, given that microstructural changes are subtler in prodromal stages.

In a separate cohort of individuals with 22q11.2 deletion syndrome – a neurogenetic condition that markedly raises the risk for schizophrenia – the model identified widespread negative deviations in mean and axial diffusivity, particularly across the entire corona radiata. Crucially, a subset of individuals showed deviations in the opposite direction, a pattern that would have been invisible in a standard group-comparison analysis.

“This monumental study took seven years to complete,” said Paul M. Thompson, PhD, associate director of the Stevens INI and senior author of the study. “The vast scale of the data and the fine scale of the brain features assessed means we can now evaluate your neural pathways relative to other people of the same age, sex, and demographics.”

### Implications for clinical trials

Beyond diagnostics, the charts open a new avenue for treatment evaluation. If a therapy targets white matter integrity – whether in Alzheimer’s disease, multiple sclerosis, or a psychiatric condition – researchers could track whether a patient’s DTI metrics shift towards age-expected centiles, or whether disease progression is slowed relative to the normative trajectory.

“This study demonstrates the power of large-scale, international data sharing to create tools the entire research community can use,” said Arthur W. Toga, PhD, director of the Stevens INI and Provost Professor at USC. “By establishing a lifespan framework for the brain’s communication pathways, this work opens new opportunities to detect subtle disease-related changes, compare conditions more rigorously, and move toward a more individualised understanding of brain health.”

The normative models are publicly available via the PCNPortal < <https://pcnportal.dccn.nl> >, and the analysis code is accessible on GitHub.

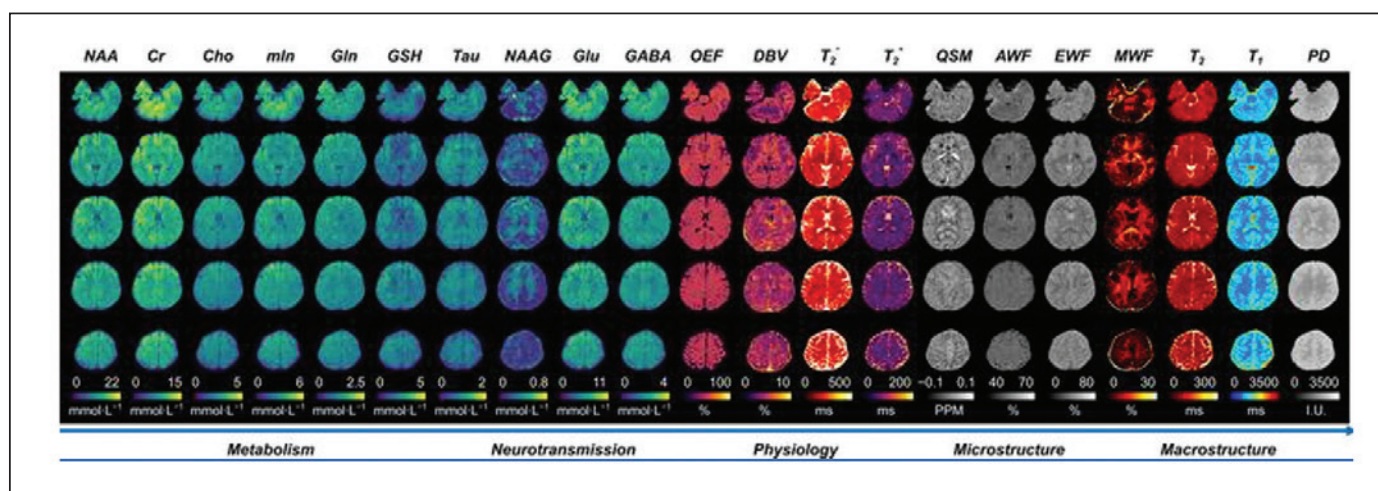
The team notes several limitations – the ENIGMA-DTI protocol is not optimised for children under five, some anatomically small or CSF-adjacent tracts show noisier model fits, and a fuller accounting of ethnoracial ancestry would strengthen generalisability – but the model’s built-in adaptation framework means it can be recalibrated to any new clinical site with as few as 25–30 local control participants.

The charts will now be applied across more than 30 brain conditions, creating a common reference standard that spans neurodevelopmental, psychiatric, and neurodegenerative disease. 

Journal reference:

Villalón-Reina, J. E., Zhu, A. H., Nabulsi, L., et al. (2026). Lifespan normative modeling of brain microstructure. *Nature Communications*, 17, 4693. <https://doi.org/10.1038/s41467-026-72875-x>





Whole-brain images from a healthy volunteer encompassing 21 biomarkers, taken in a single MRx scan. The information provides a comprehensive spectrum of information on tissue metabolism, neurotransmission, physiological function and structural characteristics. These biomarkers offer potential for better early detection and more accurate diagnosis and prognosis of brain diseases.

## One scan, 22 biomarkers: the MRI upgrade that could transform brain disease diagnosis

A new AI-powered MRI framework called multiplexed MRI (MRx), developed by researchers at the University of Illinois Urbana-Champaign and published in *Nature* on 6 May 2026, can simultaneously map more than 20 quantitative structural, physiological and molecular biomarkers of the whole brain in a single 14-minute scan on standard clinical hardware – offering clinicians an unprecedented window into brain tumour grading, multiple sclerosis lesion staging, and early disease detection that conventional MRI simply cannot provide.

For decades, MRI has been the workhorse of neurological diagnosis. Yet for all its power, the technology has remained stubbornly limited in one critical respect: clinicians typically acquire one qualitative biomarker at a time, piecing together a picture of brain pathology from a sequence of separate scans that can collectively take up to an hour. A research team led by Zhi-Pei Liang, professor of electrical and computer engineering and a member of the Beckman Institute for Advanced Science and Technology at the University of Illinois Urbana-Champaign, has now fundamentally changed that equation.

The clinical implications are immediate and substantial. In patients with brain tumours, MRx distinguished between tumour grades that looked identical on conventional imaging. In multiple sclerosis, it staged lesions without the need for contrast agents – a meaningful advantage for patients who undergo repeated scanning over many years. And it did all of this within a timeframe that fits comfortably into routine clinical workflows.

### What MRx actually does

Conventional MRI exploits magnetic resonance signals from water molecules to generate anatomical images. Separately, MR spectroscopy and spectroscopic imaging can

detect signals from metabolites such as N-acetylaspartate (NAA), creatine, choline and neurotransmitters including GABA and glutamate – but these techniques require their own acquisition protocols, deliver far lower spatial resolution, and have never been feasible to run simultaneously with structural imaging in clinical settings.

MRx dissolves that barrier. Rather than selectively exciting one or a few molecular targets, the MRx acquisition framework uses wideband radio-frequency pulses to excite all detectable molecules in the proton spin system simultaneously. Rapid echo-planar sampling trajectories then capture the resulting signals, with complementary encoding modules handling transverse relaxation, longitudinal relaxation and J-evolution in parallel. To keep scan time clinically acceptable, the team designed a sparse sampling scheme that exploits the partial separability of high-dimensional signals, image sparsity, parallel imaging and mutual information between biomarkers.

The data processing challenge – essentially reconstructing a high-dimensional image from sparse, noisy measurements where water signals dwarf molecular signals by three to four orders of magnitude – is addressed using physics-based machine learning. Subspace models represent the multiparametric spatial-spectral structure

of the signals parsimoniously, while neural networks incorporate data-driven spectral, spatial and parameter distribution priors. As study co-author Rong Guo, formerly in Liang's group and now a senior scientist at Siemens Healthineers, explained: “With our integration of ultrafast data acquisition and physics-based machine learning methods for data processing, MRx overcomes several longstanding bottlenecks to fast, high-resolution multiplexed imaging.”

The result, in a healthy volunteer, is simultaneous whole-brain maps of 22 biomarkers: molecular maps of NAA, creatine, choline, myo-inositol, glutamine, glutathione, taurine, NAAG, glutamate and GABA at  $2 \times 3 \times 3$  mm<sup>3</sup> resolution, alongside tissue property maps – oxygen extraction fraction, deoxygenated blood volume, T2, T2\*, quantitative susceptibility mapping, axonal water fraction, extracellular water fraction, myelin water fraction, T1, T2 and proton density – at  $1 \times 1 \times 1$  mm<sup>3</sup> resolution. The entire acquisition takes approximately 14 minutes.

### Validation and reproducibility

Before applying MRx to patients, the team rigorously validated the technology in phantom studies. Molecular biomarker accuracy was confirmed using a home-made spectroscopic phantom, with measured



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<sup>1</sup>WHO. Medication Without Harm. 2022.[cited 25th April 2024]. Available from: Medication Without Harm (who.int)

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concentrations showing no significant biases even in tubes of 8 mm diameter. Relaxation parameter accuracy was assessed against the ISMRM/NIST relaxometry phantom, with MRx-derived T1 and T2 values achieving regression slopes of 0.9792 and 1.0116 respectively, and R<sup>2</sup> values above 0.99 in both cases.

Reproducibility was evaluated across intra-session, inter-session and cross-centre experiments in 48 standard neuroimaging regions of interest. For most water-based parameters, coefficients of variation remained below 4% within sessions and below 7% across centres. For the main metabolites, cross-centre variation stayed below 9%. For quantitative susceptibility mapping, intraclass correlation coefficients of 0.9853, 0.9102 and 0.9074 were achieved for intra-session, inter-session and cross-centre reproducibility respectively – performance the authors describe as comparable to or better than existing MR techniques.

### Brain tumours: seeing what conventional MRI misses

The translational power of MRx becomes clear in the tumour results. In a patient with grade IV glioblastoma multiforme, the full panel of MRx biomarkers revealed a detailed map of the pathological processes underlying both tumour and surrounding oedema tissue: elevated choline indicating cellular proliferation, raised lactate reflecting anaerobic glycolysis, reduced NAA signalling neuronal loss, glutamine elevation consistent with alternative energy sourcing, increased glutathione marking oxidative stress, and hypoxia evidenced by changes in T2\*, deoxygenated blood volume and oxygen extraction fraction, among others.

Perhaps more clinically striking were the findings in oligodendroglioma. Conventional MRI – including FLAIR and contrast-enhanced T1-weighted sequences – failed entirely to distinguish between grade II and grade III tumours in two patients, both exhibiting hyperintensity on FLAIR and no noticeable contrast enhancement. MRx, by contrast, revealed substantially higher choline (58.8%,  $P < 0.001$ ) and lactate (84.3%,  $P < 0.001$ )

in the grade III tumour, reflecting greater cellular proliferation and anaerobic glycolysis, findings corroborated by biopsy histopathology.

By deriving a composite tissue state index from the full biomarker set using machine learning, the team was able to clearly separate eight distinct tissue types – grey matter, white matter, cerebrospinal fluid, oedema, meningioma, low-grade oligodendroglioma, high-grade oligodendroglioma and glioblastoma – in a single scalar map. Standard multiparametric MRI based on T1, T2 and proton density alone could not separate these states.

### Multiple sclerosis: staging lesions without contrast

In MS, the challenge is not just detecting lesions but characterising them. Active, chronic active and chronic lesions have distinct pathological profiles and different implications for treatment, yet current clinical MRI modalities cannot reliably distinguish between them without contrast agents, or at all in some cases.

MRx addressed this directly. In one MS patient with both active and chronic lesions, the MRx tissue state index map correctly identified and differentiated the two lesion types, whereas the standard multiparametric MRI tissue state index mislabelled them. The mechanistic underpinning was clear in the biomarker data: lactate was significantly elevated in active lesions (210.2%,  $P < 0.001$ ), consistent with increased aerobic hyperglycolysis during acute inflammation; the myo-inositol/NAA ratio was higher in chronic lesions (32.4%,  $P < 0.001$ ), reflecting gliosis accumulation; and active lesions showed increased T2 (32.7%,  $P < 0.001$ ) and markedly reduced myelin water fraction (510.8%,  $P < 0.001$ ), indicating ongoing demyelination. All of this was achieved without the contrast agents currently required in standard clinical practice.

MRx also showed predictive capability. In a separate MS patient, baseline MRx biomarkers obtained at an initial scan correctly predicted which lesion voxels would evolve, remain stable or shrink over a four-month follow-up. A pre-lesion invis-

ible on FLAIR showed early elevation in myo-inositol/NAA, signalling gliosis and axonal dysfunction before any structural change was apparent.

### A new era for brain imaging

Liang was measured but clear about where this technology leads: “MRx can be a powerful tool for noninvasive tissue characterisation, helping to advance personalised, precision and predictive medicine. By providing rich, multidimensional biomarkers to capture disease progression and treatment response, this capability could open new opportunities for more precise diagnosis, individualised treatment planning and improved patient outcomes.”

The authors also point beyond the biomarkers demonstrated in this study. MRx is extensible to diffusion, perfusion, magnetisation transfer and elastography-based tissue properties, and with multinuclear RF systems could eventually image biomarkers from deuterium, sodium and phosphorus simultaneously. The team also foresees a role in the development of digital brain twins – AI-powered generative models capable of predicting disease trajectories – for which MRx could supply the informative imaging biomarkers that current technology cannot provide.

As first author Yudu Li, professor of bioengineering at Illinois, noted: “Diseases such as tumours, multiple sclerosis and neurodegenerative disorders are highly heterogeneous. The rich set of biomarkers obtained using MRx has the potential to provide deeper insights into brain function and disease processes, while also improving the sensitivity and specificity of detection and diagnosis.”

With whole-brain scanning completed in 14 minutes on standard 3T clinical systems, the barrier to clinical adoption is considerably lower than might be expected for a technology of this scope. Whether the complexity of AI-driven data processing and the need for clinical validation at scale can be navigated efficiently will determine how quickly MRx moves from research to routine practice – but the case it makes for doing so is compelling. MEH

Journal reference:

Li, Y., Guo, R., Zhao, Y., et al. (2026). Multiplexed magnetic resonance imaging. *Nature*, 653, 411–417.  
<https://doi.org/10.1038/s41586-026-10475-x>

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# Phones on the wards: hospital staff mobiles found harbouring drug-resistant superbugs

A study of 95 healthcare workers' mobile phones across Australia and the UAE has found that nearly all carried bacteria linked to the world's deadliest infections, alongside the genetic machinery that helps those bacteria resist antibiotics. Published 22 May 2026 in *MicrobiologyOpen*, the findings raise questions about a routinely overlooked infection-control gap.

Hand hygiene has long been the cornerstone of infection prevention in hospitals. But a new international study suggests that clinicians' pockets may be undoing some of that good work. Researchers screening the genetic material on 95 mobile phones belonging to healthcare workers in Australian and Emirati hospitals have found that the devices are widely contaminated with bacteria responsible for a large share of global infection deaths – along with the resistance and virulence genes that make those infections harder to treat.

The implications for clinical practice are immediate and practical: phones, which travel constantly between wards, patient bedsides, staff rooms and toilets, are rarely included in routine disinfection protocols. If phones are acting as an unrecognised reservoir for hospital-acquired infections, then infection-control bundles that stop at hand hygiene may be missing a significant transmission pathway.

## Superbugs hiding in plain sight

The research team, which included scientists from Bond University, The Prince Charles Hospital in Brisbane, and institutions in the United Arab Emirates, used next-generation metagenomic sequencing to analyse swabs taken from the phones. Rather than culturing bacteria on agar plates, this technique reads raw DNA directly from the swab, allowing the researchers to detect a far broader range of microbial life and the resistance genes travelling with it.

On average, each phone carried 3.62

species from the ten bacteria most strongly associated with global mortality, and 2.49 of the notorious ESKAPE pathogens – a group of six organisms (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa* and *Enterobacter* species) that are collectively responsible for the bulk of antibiotic-resistant hospital infections worldwide. Three organisms in particular – *S. aureus*, *P. aeruginosa* and Group B *Streptococcus* – turned up on more than half of all phones tested, while 75% of devices carried more than one high-mortality bacterium, and seven phones carried all five of the gram-negative species examined.

As the authors put it in their paper, mobile phones “harbour pathogens alongside genes associated with increased virulence and antimicrobial resistance,” a combination that, while not proof of direct transmission, “highlights the potential for increased antibiotic resistance and virulence.”

## A phonome of resistance genes

Beyond simply identifying bacteria, the team catalogued the genetic toolkit those bacteria carry. Across the sample set, they found 262 unique antibiotic-resistance genes, 448 unique virulence-factor genes, and 314 unique bacteriophages – viruses that infect bacteria and, in doing so, can shuttle toxin- and resistance-encoding DNA between species. The researchers have coined the term “phonome” to describe this composite microbial and genetic ecosystem living on a device most

people touch hundreds of times a day.

Some of the resistance signatures identified were clinically significant. *P. aeruginosa* samples showed extensive resistance machinery spanning cephalosporins, fluoroquinolones, aminoglycosides and tetracyclines, while genes conferring resistance to carbapenems – often considered a last-resort antibiotic class for gram-negative infections – were co-located with *E. coli*, *K. pneumoniae*, *A. baumannii* and *Enterobacter* species. Methicillin-resistance genes associated with *S. aureus* (the *mec* gene family behind MRSA) were identified on 22% of phones.

The paper's authors are careful to note that gene presence does not automatically translate into active infection risk. Their sequencing approach, they write, “cannot distinguish active transduction events,” and detecting a resistance gene on a swab does not confirm it is being expressed in a way that would cause disease. Even so, the recurring detection of genes linked to plasmid conjugation, transposons and integrons across samples convinced the team that phones may function as more than passive carriers. In their conclusion, the authors state that these devices “act as microhabitats for HGT contributing to the global development of antimicrobial resistance” – HGT referring to horizontal gene transfer, the process by which bacteria swap resistance traits with one another.

## A blind spot in infection control

Dr Lotti Tajouri of Bond University, one of the study's authors and a member of the



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## PROJECTS 2026





Dubai Police Scientific Council, argued that phones represent an overlooked gap in existing hygiene protocols. “Hospitals place a strong emphasis on hand hygiene, but mobile phones are often overlooked despite being handled constantly in clinical settings,” he said. “These devices move between wards, patient areas and personal spaces, yet they are rarely disinfected as part of routine infection-control practices.”

Tajouri suggested that closing this gap need not be complicated, proposing that regular phone disinfection protocols could become an additional tool in reducing the spread of hospital-acquired infections. Co-author Dr Adrian Goldsworthy was careful to frame the study’s limits: while it does not demonstrate that infections have actually been transmitted via mobile phones, he noted that it highlights an important and previously underappreciated contamination pathway.

That caution is echoed in the paper itself. The authors’ study design, drawing on metagenomic data from earlier phone-swabbing studies conducted in Australia and the UAE between 2021 and 2022, could not track bacteria from a phone into a patient. What it could establish is a plausible mechanism, and a strikingly consistent one across two very different health-care systems and climates.

### Why cleaning is trickier than it sounds

One of the more sobering findings concerns disinfection itself. The researchers identified genes such as *qacC* and *qacE 1*, which reduce bacterial susceptibility to quaternary ammonium compounds – the active ingredient in many hospital surface wipes – on a substantial number of phones. Genes linked to biofilm formation were also common, suggesting that some bacteria on phone surfaces may be shielded within a protective matrix that ordinary alcohol wipes struggle to penetrate.

The paper’s discussion section works through the practical trade-offs of available cleaning methods. Alcohol-based wipes reduce viable bacterial counts but are less effective against biofilms and left-over extracellular DNA. Chlorine-based wipes tackle biofilms more effectively but risk corroding phone casings with repeated use. Ultraviolet-C sanitisation units, increasingly marketed for hospital use, have shown more than 99% microbial reduction in controlled studies, but the authors caution that the UV-C device market has “historically lacked stringent regulatory oversight,” meaning efficacy claims are not always reliable, and that UV-C does not necessarily eliminate residual DNA that could still support gene transfer.

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### Setting the wider context

The scale of the underlying problem is considerable. Bacterial infections were linked to an estimated 13.7 million deaths worldwide in 2019, and hospital-acquired infections in Europe alone account for more than 25 million additional hospital bed days each year, at a cost of between 13 and 24 billion euros. Against that backdrop, the authors argue that phone hygiene should not stand alone but be folded into broader infection-prevention bundles targeting other frequently touched surfaces such as bedrails, curtains, bedside tables and monitors.

The team also points to behavioural science frameworks, such as the COM-B model and Theoretical Domains Framework, as tools hospitals could use to design phone-hygiene interventions that staff will actually adopt, addressing barriers such as scepticism about UV-C safety or the simple absence of reminders built into existing hand-hygiene routines. MEH

Reference:  
Goldsworthy, A., Olsen, M., Obonyo, N. G., et al. (2026). Hospital Associated Antimicrobial Resistant Bacteria on 95 Mobile Phones: An International Metagenomic “Phonome” Analysis. *MicrobiologyOpen*, 15(3), e70321. <https://doi.org/10.1002/mbio3.70321> 11



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