When seconds count: tackling neurological emergencies

The global shortage of neurologists has possibly had the largest effect in emergency rooms and other critical-care settings. Experts are now turning to conventional and novel means to improve neurological care in emergency settings. Kathlyn Stone reports.

Neurological emergencies carry a high burden. 30-day mortality rates can be as high as 50% for patients with intracerebral haematoma, 29% for those with traumatic brain injuries, or more than 20% for cases of status epilepticus. Moreover, 50% of cases of subarachnoid haemorrhage are fatal, according to data from the Neurological Emergencies Treatment Trials (NETT) network in the USA. This network is a collaboration of 17 US university research centres working with community hospitals.

For more on **NETT** see http://www.nett.umich.edu/nett/welcome

Dhimant Dani, a neurointensivist at the Medical College of Wisconsin in Milwaukee, WI, USA, is one of a small number of full-time US physicians who has specialised skills in neurological emergency care. Dani asserts that the blending of emergency medicine and neurology is long overdue. "All patients in the intensive care unit are my primary patients", says Dani. As a neurologist, he takes a leadership role in management of patients and has access to all of a patient's data. But his situation is uncommon.

For more on **telestroke** see *Lancet Neurol* 2008; **7:** 787–95

In one rare study to assess neurologists' effect on the treatment of critical-care patients, it was found that neurologists were called to evaluate just 14·7% of all patients admitted to the emergency department over a 1-year period. The study found that a third of 11 421 emergency-room admissions for neurological emergencies were misdiagnosed by the admitting emergency-medicine team. Thierry Moulin, lead author of the study and founder of a regional emergency-neurology network in France (Réseau d'Aide au Diagnostic et aux Soins des Urgences Neurologiques de Franche-Comté; RUN-FC), reported that neurologists offered a complete change of diagnosis from the initial one in 52·5% of cases.

For more on the **effects of neurologists on patients' management and outcome** see *Eur Neurol* 2003; **50:** 207–14

For more on **SOC** see http://www.specialistsoncall.com/

Emergency care requires a response within minutes or hours, often to patients who are unconscious or who are having seizures. But informed consent rules have, until now, been a barrier to clinical trials of emergency interventions. Under the National Institute of Neurological Disorders and Stroke umbrella, NETT has arranged for national clinical trials to be led by investigators from emergency medicine, neurology, and neurosurgery disciplines. The network's first two trials began data collection this year. The safety and efficacy of progesterone, found to have neuroprotective properties in animal models of brain injury, will be investigated for the treatment of traumatic brain injury in human beings. In another trial, investigators hope to determine whether midazolam, when injected intramuscularly, is as effective at stopping seizures as lorazepam is, when injected intravenously. Trial coordinators have been granted an exception to the requirement of informed consent under federal rules covering emergency-research studies.

"Will having neurologists trained in emergency medicine ... be helpful in the final outcome for patients?"

Public and private organisations in Europe and the USA are tackling the need for emergency-neurology expertise on many fronts. The developments go beyond increased training of neurologists and emergency physicians for the treatment of stroke, seizure, and head trauma in a critical-care setting. Both in Europe and in North America, companies and hospitals are developing "neurologists on call" services that place a heavy reliance on telemedicine.

The RUN-FC stroke network is a regional emergency-neurology response network in eastern France that serves 1·2 million people through a collaboration of ten general hospitals and a university hospital with a stroke centre. The six-member team at the Jean-Minjoz University Hospital in Besançon, France, includes three senior doctors and three resident junior doctors of neurology, neurosurgery, and radiology. The team is on call 24 h a day, 7 days a week to respond to neurological emergencies, primarily stroke and head injuries.

Moulin thinks that the rapid adoption of telestroke has benefits beyond improved stroke outcomes. Telestroke networks that work alongside comprehensive stroke centres could shorten hospital stays, reduce the number of patient transfers, identify earlier the patients with stroke who require urgent interventions or surgery, and deliver earlier diagnosis and improved treatment for all patients. Additionally, says Moulin, the use of telestroke could pave the way for exporting expertise on stroke and other neurological emergencies to low-income countries.

In March, Specialists On Call (SOC), a private US provider of emergency-neurology consultations by telemedicine, announced that it would add ten more states to its coverage area in 2009. Colin McDonald, a neurologist and SOC's medical director, founded the company in 2005 with backing from venture capitalists and private investors. SOC recently began offering emergency consultations in Montana, USA, which has just seven neurologists serving the entire state

population of 980 000. But most of SOC's 60 consulting agreements are with hospitals in large-population states, including California, Florida, Texas, New Jersey, and Virginia.

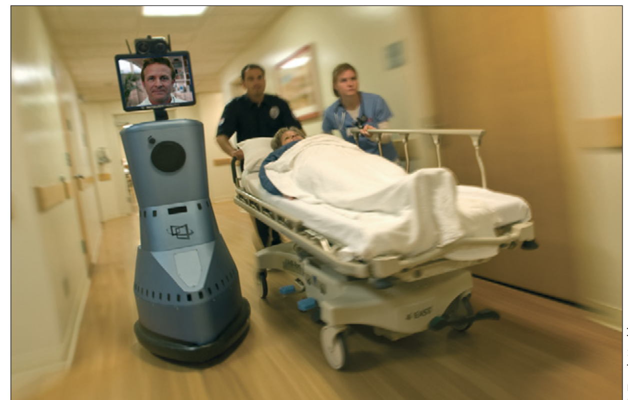
According to Clark Wells, an SOC employee and spokesperson, the company has managed more than 6000 emergency-neurology consultations since its founding, of which 61% were for cerebrovascular emergencies (stroke, transient ischaemic attack, and intracerebral haemorrhage). Other emergencies involved seizures, encephalopathy, migraine, syncope, vestibulopathy, transient global amnesia, and brain tumour, and each represented 6% or less of the total consultations.

"We see all kinds of neurologic problems", says McDonald, who trained as a neurointensivist; however, it is clear that intervention in acute stroke cases is the bulk of emergency consultations. Stroke is the third leading cause of death in the USA, and has been so for 15 or 20 years, adds McDonald. "We've not done very much to move those numbers. The solution to reducing death from stroke has to be telemedicine. Nothing else has appeared on the horizon in the last 10 years that can improve neurologic health care." More than 40 university and private-practice neurologists give a minimum of 32 h of their expertise a month through SOC's consolidated teleconferencing, public affairs councils, and electronic medical record system. McDonald says he has had no difficulty recruiting neurologists to sign on as SOC consultants. Paradoxically, many local neurologists are not interested in taking on emergency calls at their place of practice, says Wells. That system pays less than a private or medical centre practice, and often exposes neurologists to greater litigation risks. "It's almost cost prohibitive", he adds. Consulting neurologists can sometimes be viewed as a threat by local physicians and neurologists, says Wells. SOC works to dispel that view by pointing out that remote on-call neurologists do not steal patients. After dealing with the emergency, they refer patients to local specialists for all follow-up procedures.

The emergency-neurologist positions appearing at some hospitals are also driving some new discussions on process and logistics as this field evolves and as neurologists carve out a niche based on providing better outcomes for patients. Will having neurologists trained in emergency medicine—and emergency-medicine physicians trained in the emergency aspects of neurology, cardiology, and infectious disease—be helpful in the final outcome for patients who present with such problems? The American Academy of Neurology (AAN) believes so and is investing time and resources to develop "a body of knowledge" for care of critically ill patients with neurological disorders. The goal is to have the information broadly incorporated into clinical practice, education, and research. The AAN is developing core curriculum for fellows, residents, and medical students, and offers accreditation and certification in critical care and emergency neurology subspecialisation. The next certification examination will take place in 2010.

This plan is a wide-reaching one that will take time. After all, intravenous alteplase was embraced by key medical societies and the US Food and Drug Administration 13 years ago, yet not all designated stroke centres are meeting targets for alteplase therapy for patients with stroke, according to several studies presented at this year's AAN meeting. In the meantime, hospitals are increasingly turning to consultants and new technologies to improve neurological care in emergency settings where time is of the essence but expertise is absent. One such novel approach that goes far beyond teleconference is in use in Kentucky, USA, a state where the death rate from stroke has been 10% higher than the national average.

13 Kentucky hospitals are now enrolled in the University of Louisville's "physician remote presence robot network" launched in 2007. The system gives experts in stroke, movement disorders, and other neurological diseases at the university research hospital control in determining treatments for patients in underserved and rural areas of the state. Neurologists can observe and speak with patients or their caregivers, and consult with their physicians at the regional hospitals around the clock through a secure wireless internet video connection.



InTouch Health

Neurologist attending a patient via an RP-7 robot

The experts based in Louisville use a joystick to drive the RP-7 device, a 165-cm tall robot, to remote patients' bedsides. Patients can see and speak with the neurologist via a computer screen, which is placed where the robot's head might be. The machine has a stethoscope to listen to heart, lung, and carotid-artery sounds for evidence of a stroke, and the neurologist uses the two-way audio and video screen to view monitors, charts, and test results and to then make a recommendation on use of alteplase or other therapies.

Some of the critical-care models being explored might not withstand the test of time, but their successes and failures are helping to shape the future delivery of emergency-neurology services locally, regionally, and globally.

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