



## RESEARCH ARTICLE

# IMPLEMENTING QUALITY CARE INDICATORS IN ISRAELI STROKE CARE: MAIN BARRIERS AND THE ROLE OF REGIONAL AND OTHER INEQUALITIES

\*<sup>1</sup>Khaled Awawdi, <sup>2</sup>Riad Abu-Rakia, <sup>3</sup>Daher Zidan and <sup>4</sup>Mahdi Tarabeih

<sup>1</sup>Nursing Sciences, Israel Academic College, Ramat Gan 52275, Israel  
Health Services Research department, Ministry of Health, Jerusalem 9446724, Israel  
<sup>2</sup>Nursing Science, Tel Aviv-Jaffa Academic College, Tel Aviv-Jaffa 6818211, Israel  
<sup>3</sup>Specialist in internal medicine, Holy Family Hospital, Nazareth 16234, Israel  
<sup>4</sup>Nursing Science, Tel Aviv-Jaffa Academic College, Tel Aviv-Jaffa 6818211, Israel

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### ABSTRACT

**Background:** The aims of this study were to map the barriers to the implementation of quality indicators in the treatment of acute ischemic stroke, and the part of regional and other inequalities in those barriers.

**Methods:** 16 staffers from hospitals in Israel's North and Central region (doctors, nurses, technicians, quality coordinators, social workers), all closely involved in stroke care planning, were interviewed in depth.

**Results:** The main barriers to effective stroke care are: (a) public ignorance of stroke symptoms and how to respond, and inadequate staff training; (b) resource shortages and poor resource organization; (c) staff-patient and staff-staff communication; (d) poverty and age discrimination.

**Conclusion:** Closing inter-regional gaps will have the greatest effect on national treatment outcome rates. There are numerous relatively low-cost but impactful investment targets. Quality indicators are interdependent: the solution is an Integrated Care Pathways strategy. Information campaigns can stop stroke victims arriving late to hospital care.

**Key words:** Acute ischemic stroke; care quality indicators; barriers to quality indicators; cultural congruence; inter-regional inequalities; Integrated Care Pathways; age discrimination.

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### INTRODUCTION

For all the major advances made in stroke care practice in advanced healthcare systems stroke is still the third highest cause of death and a major cause of disability in states with highly developed healthcare systems, including Israel. Delayed diagnosis and inappropriate care are significantly linked to the disability and reduced quality of life experienced by 70% of stroke sufferers (Streifler, Raphaeli, Bornstein, Molshatzki, and Tanne, 2013). In 2013 the Israel Ministry of Health (MoH) began to identify issues, illnesses and illness states where current medical practice was failing to achieve expected standards. Two such points of focus were the care and treatment of acute cardiac infarction and infection prevention and a third the care and treatment of acute cerebral ischemic stroke (AIS). For each of these areas the Ministry decided to raise care standards by defining and instituting, nationwide, a battery of linked quality indicators (QIs) to be applied across all relevant facilities and contexts.

Regulations were enacted, making it obligatory for all hospitals to regularly report their indicator measurements to the Ministry of Health and making these results transparent to public inspection (Ministry of health, 2012).

#### Selecting and assimilating quality indicators

Israel adopted the four Joint Commission International criteria for the selection of process indicators: (1) a firm evidence base that the indicator has a substantial effect on outcomes; (2) accurate measurement is feasible; (3) process and outcome are firmly linked; (4) the indicator is not potentially harmful (Chassin, Loeb, Schmaltz, and Wachter, 2010). The defining of indicators for each area of medicine began with a literature survey of clinical indicators already in use elsewhere and of clinical practice recommendations. The indicators selected from this process were then referred to the relevant professional bodies and national healthcare advisory boards in Israel for their opinion. The third step was to pass the resultant indicators to the MoH's QI Advisory Board (IPHCQI) to decide which ones would be prioritized for use.

\*Corresponding author: Khaled Awawdi,  
Nursing Sciences, Israel Academic College, Ramat Gan 52275, Israel.

Each indicator selected for use was then issued in a uniform format, comprising its description, the rationale and criteria for its choice and content, the definition of its numerator and denominator, a definition of the variables required for its quantification and a uniform measurement algorithm. Crucially, the MoH did not content itself with issuing directives, even backed up by regulation. It added a battery of support initiatives to bring hospital managements and clinicians on board the project and sustain compliance:

- *Experts on care quality measurement went out to talk to hospital managements and senior clinicians.* Study and training days were held in hospitals (De Vos *et al.*, 2009).
- The measurement algorithm *was explained and demonstrated* to each hospital by IPHCQI staffers, to ensure uniform measurement cross the country.
- *A unique profile was compiled* for each hospital setting out the information sources in each hospital which would supply the variables to be measured for each indicator.
- The IPHCQI *evaluated the quarterly QI data* submitted by, amongst other tactics, sending out senior IPHCQI nurse/inspectors (there are 12 of these—the senior author of the present study is one) to randomly select a 25% sample from the data submitted and checking it against the hospital medical records of named patients.
- On the basis of the first year's results *a target was set for the measurement of each indicator*, including the median, mean and 75<sup>th</sup> percentile. In most cases the measurement target was set on the basis of the 75<sup>th</sup> percentile.
- IPHCQI staff used their assessment of QI data quality to *map the barriers to the assimilation of quality indicators and feed their findings back regularly to each hospital.*
- *All hospitals were instructed to appoint a Quality Coordinator*, tasked to ensure their staff assimilated the QIs into ward practice. The great majority of these coordinators sat on their hospital's management board.

Since every change process encounters organizational and personal resistance (De Vos *et al.*, 2009) the aim of the present study was to reinforce this barrier-measurement effort by identifying and mapping the barriers to the implementation of quality indicators in the care and treatment of AIS across the healthcare system. A second aim was to discern how regional and other population inequalities contribute to the formation and weight of these barriers.

### Stroke care provision in Israel

Perhaps the essential characteristic of stroke care is the relatively short window of time (4-8 hours from symptom onset) within which the most effective medical/surgical treatments can be delivered effectively (e.g. the thrombolytic agent, tissue plasminogen activator (tPA) has to be administered within 4.5 hours of symptom onset and cerebral artery catheterization (CAC) within 8 hours of symptom onset). Organizing national stroke care into a tightly integrated multi-phase system by means of the establishment of Integrated Care Pathways and a network of dedicated stroke units is the current strategy in the USA and several European states, where it has been shown to improve both treatment quality and outcomes (Alberts *et al.*, 2005; Stroke Unit Trialists' Collaboration, 2013).

This for Israel may be the next big step. Currently Israel has relatively few specialist stroke units and stroke beds: half of patients, across the country, are treated on internal medicine and neurological wards (this does not necessarily imply that they do not receive appropriate care and treatment). Before the abovementioned QIs began to make their impact Israel recorded some 13-15,000 strokes each year (Goldberger, Aborba, and Haklai, 2017). 16% of these stroke sufferers died within three months, 30% required nursing-home care, and some 50% were discharged from hospital with varying degrees of disability (Koton and Tanne, 2013). In 2013 only 13% of hospitalized stroke patients were administered a cranial CT scan within 25 minute of admission and less than 25% received t PA within an hour of admission. In 2014 only 305 patients received either t PA or CAC within the permissible treatment 'window' (ISRAEL NEUROLOGICAL ASSOCIATION, 2016). A significant shortcoming of Israel's healthcare system is that it is beset by inequalities of availability and access, inequalities of which the residents of the country's two peripheral regions—North and South—are the chief sufferers, in terms of both the provision of, and distance from, healthcare services.

Population density in the North for instance, is one-fifth that of the Centre and Tel Aviv, where the majority of Israel's population and economic power sources are concentrated. Income and education levels are also much lower in the North. The disparities are ethnic too: 57% of the North's residents are Israeli Arabs; 88% of the Centres' residents are Israeli Jews (Israel's Central Bureau of Statistics, 2017). Table 1 sets out some of the key socioeconomic, general healthcare and stroke care variables in a comparison of the Central and North regions (a comparison of the Central and South regions would present similar disparities). The Centre has to have more healthcare facilities than the North since it holds more than double the population. What makes the North relatively poorly served is (a) the lack of provision in absolute terms, e.g. only one Northern facility is equipped to provide CAC, (b) the uneven distribution of t PA units within the North—none exist in the hospitals which serve much of the Arab population, (c) the North has no large conurbations like Tel Aviv, and (d) facilities are usually a distance from patients' homes. The maximum ambulance arrival time set for the centre (10 minutes) is unachievable in the North. For access to stroke care where every minute counts this is very damaging.

Since only one Northern facility is equipped to provide CAC many patients have to be further transported to Haifa (the most northerly conurbation) or even to a hospital in the Centre, this delay generating the expected negative results for treatment outcomes. Neurologists are also scarce. Rehabilitation beds are in such short supply (and also of inferior quality) compared to central Israel that 70% of post-discharge stroke sufferers in the North refuse to take up a bed even if one can be found because of its distance from their home (Averbuch and Avni, 2016). The regional inequalities in healthcare availability and access have been long well-known. In 2010a 5-year nationwide plan (2011-2016) to reduce these inequalities was at last declared by the Ministry of Health, to be applied across all healthcare facilities. It set out six objectives—to reduce access disparities caused by financial hardship (e.g. by cutting out-of-pocket payments from patients); to make services more culturally and linguistically congruent—so as to expand take-up by ethnic minorities; to recruit more high-quality specialist staff for the two periphery regions; to build and equip more facilities in

these regions; to compel (by new regulations) and incentivise the four major health management organizations to join the battle against inequality; to conduct a public information/awareness campaign on risk factors, dangerous symptoms and available services (Averbuch and Avni, 2016).

### The care quality indicators selected for AIS care

From the first call for help through to the decision on the appropriate form of treatment and thence to post-discharge rehabilitation, five indicators were selected to improve the care given at five key junctures in the AIS care process (Akka-Zohar *et al.*, 2015). Pre-hospital phase

- A standard assessment for stroke to be made when AIS is suspected.
- Advance warning to be sent to the hospital that a suspected AIS case is imminent.
- Hospital phase
- CT/MRI scan to be performed within 25 minutes of AIS patient's admission.
- Thrombolytic treatment (intravenous rt-PA) to be administered of to AIS patients who are within 4.5 hours of symptom onset and/or cerebral blood vessel catheterization (CAC) within 8 hours of symptom onset. Provided that the patient was admitted to hospital within a maximum of 3.5 hours of symptom onset .
- Rehabilitation phase
- Administer FIM-in functional assessment tests on admission to rehabilitation and FIM-out tests on discharge from rehabilitation.

The Mo H added two further components to the AIS care improvement effort. In 2013 a triennial survey of all stroke patients in general hospitals was instituted (NASIS, 2013) which collected data on state of health on admission and discharge, the symptom-onset-to-hospital-admission time, medical history and risk factors, diagnosis, treatment, and medication. In 2014 a National Stroke Registry was set up. Its comprehensive database on stroke in Israel was made of sufficient quality to identify prevention and treatment needs, to monitor trends in the incidence and treatment of stroke, and to provide the basis for both interventions and the evaluation of their effectiveness.

## MATERIALS AND METHODS

### Data collection

In 2017I interviewed 16 selected staffers (neurologists, EMR doctors, EMR and other senior nurses, radiology technicians, quality coordinators and social workers) at three hospitals involved in the treatment of AIS patients in order to get their views on the success or otherwise of the AIS treatment process and the contribution to it of the five new care quality indicators. The three hospitals, two in Israel's periphery (North region) and the third a major hospital in the Central region, were chosen to enable inter-regional comparisons. I conducted all the semi-structured interviews myself. All interviewees were chosen as the staffers most closely involved in the planning and provision of stroke care in their respective hospitals, and constituting together a spread of professions and departments sufficient to provide a fully representative picture of stroke care in all three institutions.

The staffer questionnaire was composed by the researcher and a multidisciplinary team experienced in the care and treatment of AIS. The extensive experience of the IPHCQI quality inspectors in analysing the quality measurement data submitted by the nation's hospitals allowed this study to dispense with personal observation of hospital practice and rely on interviews with the most knowledgeable professionals (see the Appendix for the full questionnaire).

## RESULTS

By and large staff members across all the professions represented acknowledged the importance of the drive to improve the quality of stroke care—it would improve outcomes, raise patient satisfaction, promote their quality of life and enable both staff and patients to make the best use of the resources at their disposal. But the staffers had also encountered multiple impediments to the implementation of the indicators, large and small and across all phases and sectors of stroke care. Table 2 shows that content analysis of the interview data grouped these impediments and discontinuities into four barrier categories.

### Knowledge barriers

**In the general population:** There is widespread ignorance of stroke in general, of the symptoms indicative of it, and of the steps that need to be taken as soon as stroke is suspected, e.g. the importance of getting to the nearest hospital as soon as possible. 14 of 16 Interviewees believed that 70% of stroke patients got to hospital far too late: a large proportion went to their local primary care clinic first instead of rushing to hospital or waited for their symptoms to pass or for the end of the Sabbath.

**In hospital staff:** Experienced professionals thought that *"The correct evaluation of a patient is a function of who talks to him."* The diagnoses of EMR doctors on night and weekend shifts were often unreliable. General practitioners (GPs) missed many stroke diagnoses, particularly in Israeli-Arab areas of the country. GPs who some stroke victims turned to instead of getting to hospital could/should be trained to perform a FAST assessment before the ambulance arrived.

### Resources and resource organization

**Treatment resources:** This was by far the major concern: all but one of the interviewees voiced it: *"Reinforcements are needed at every level in Emergency Rooms."* *"You get situations where one doctor is covering both a ward and the Emergency Room"* *"Sometimes there's no one to operate the CT scanner, especially weekends."* Others complained, in both Centre and North, that there were few or no dedicated stroke units or even dedicated stroke wards. Even in the more affluent Central region there was a severe shortage of EMR beds, let alone dedicated stroke beds. *"You sometimes get four patients fighting over the one available bed."* There was also a shortage of rehabilitation beds (particularly in the North). Equipment shortages sometimes caused a treatment window to be missed or led to premature discharge from hospital. *I'm on my own here. I'm my own technician and clerk"* (X-ray technician). CT scanners were too few, in places only one for a whole hospital, the Emergency Room included. Sometimes, again especially in the north, ambulances were not available to carry discharged patients to and from rehabilitation care.

**Table 1. Comparing Israel's Central and North regions by socioeconomic and healthcare provision indicators**

	Type of area	Socio-economic status	Social service provision	All doctors per 1000 persons	All nurses per 1000 persons	Hosp-ital beds per 1000 persons	Number of rehabilitation beds	Number of tPA units	Number of centres providing Cerebral Artery Catheterization
Central Region (inc. Tel Aviv)	Urban	High	Good	3.4	4.7	1.71	650	8	5
North region (exc. Haifa)	Mostly rural	Mostly low	Low	2.3	4.4	1.57	143	4	1

**Table 2. Barriers to the implementation of care quality indicators in AIS care—by prominence in staffer interviews**

Barriers	%age of staffers citing	Examples
Lack of knowledge <ul style="list-style-type: none"> <li>In patients</li> <li>In staff</li> </ul>	87% 31%	<ul style="list-style-type: none"> <li>The public don't know the symptoms of stroke and the urgency of getting to hospital.</li> <li>Emergency Room doctors on evening and night shifts do not always diagnose reliably.</li> <li>GPs can miss AIS diagnoses.</li> <li>Young hospital doctors not good enough at (a) identifying AIS (b) identifying appropriate treatment.</li> <li>Ambulance crews could be better trained.</li> </ul>
Lack of resources <ul style="list-style-type: none"> <li>Quantity</li> <li>Resource organization</li> </ul>	94% 31%	<ul style="list-style-type: none"> <li>Severe shortage of staff in all care and treatment areas, particularly in emergency rooms (EMRs), and in EMRs particularly on evening and night shifts, and on weekends and public holidays. All such shortages are markedly worse on Israel's northern periphery.</li> <li>Treatment protocols, recommended clinical pathways and quality indicators may be absent or ignored.</li> </ul>
Coordination, Communication <ul style="list-style-type: none"> <li>Staff-patients</li> <li>Staff – staff</li> </ul>	31% 63%	<ul style="list-style-type: none"> <li>Delays in anamnesis and diagnosis because stroke patients are unable to explain what has happened to them or they come without an escort —time is lost and treatment windows missed.</li> <li>Ambulance crews do not warn hospital of patient arrival. Sometimes do not register time of symptom onset.</li> <li>Nurses do not report actions they take to physicians.</li> <li>A patient may wait in triage without a neurologist being summoned.</li> <li>Hospital staff do not know what quality indicators obtain in sectors other than their own.</li> <li>Hospital computerization still incomplete.</li> </ul>
Cultural/ socioeconomic factors <ul style="list-style-type: none"> <li>In patients</li> <li>In staff</li> </ul>	62% 69%	<ul style="list-style-type: none"> <li>Arab and Ethiopian women wait at home with symptoms for menfolk to arrive.</li> <li>Many poor elderly live alone: it is not rare for them to be discovered long after symptom onset.</li> <li>Distances to treatment centres are longer in the North.</li> <li>Discrimination is common against the 60+, in the allocation of both acute care and rehabilitation care.</li> </ul>

**Resource organization:** Some managers failed to ensure that organization and training was optimal, that all resources were on hand, that practice innovations and protocols (including the latest QIs) were assimilated. Younger doctors were not always sufficiently aware of treatment protocol requirements. Over a third of interviewees, particularly in the North, complained of the absence, ignorance and ignoring of treatment protocols and of recommended clinical pathways. The two new QIs added to the stroke hospital treatment protocol were not always observed.

### Coordination and communication

**Staff-patient:** 5 of 16 interviewees complained that many patients, either from ignorance or because of the stroke, cannot explain their symptoms or why they have come to the hospital, which makes anamnesis and diagnosis difficult and slow. Some come without an escort to explain for them. There can be language barriers. Treatment windows are missed.

**Staff-staff:** The process from admission to assessment to diagnosis to treatment is complex and to operate efficiently requires high-quality communication but there was non-coordination both between and within sectors. 10 of 16 interviewees did not fully know what care quality indicators obtained for stroke care, particularly in sectors other than their own.

Hospital doctors, for instance: *“Are there care indicators in other sectors? I had no idea.” “As to what the ambulances do I just don't know.”* Ambulances more often than not do not warn the hospital in advance of bringing a patient in and sometimes do not register the time of symptom onset. Nurses do not always report what action they have taken to physicians. A patient might wait in triage without a neurologist being summoned. *“Coordinating treatment between one department and another is always breaking down. Data is passed on with mistakes in it.”* Hospital computerization has improved communications significantly but in some hospitals is still incomplete: *“Handwritten reports always take longer and always have mistakes in them”.*

### Sociodemographic and socioeconomic barriers

This section refers to barriers deriving from age, gender, income and education, place of residence. Interviewees were rather reluctant to open up on this issue, since in principle all or most of these barriers should not exist.

**Age:** 11 of 16 interviewees admitted to adopting or knowing of discrimination against older patients, both as regards acute care and rehabilitation care.

*“To be honest I've noticed that with respect to the older patients...it's as though the notion of transferring them to tPA*

doesn't even cross your mind." "Some rehabilitation facilities won't even take in the over 60s."

**Age and income:** Many of the elderly live alone and, especially among the poorest, it is not rare for them to be discovered some time after symptom onset, which has obvious implications for their treatment, both in terms of time elapsed since symptom onset, what is known about the circumstances of the onset, and what they can report about themselves.

"You get the parents living in the north and their kids in the centre, so that there's no one to pay attention to them."

**Gender:** On the other hand, not a single interviewee thought gender discrimination operated, in favour of either men or women. The only gender difference mentioned by an interviewee was one of cultural passivity: "An Arab or Jewish Ethiopian woman will wait at home with her symptoms until her husband or son gets back from work" since women from these communities are not expected to travel to hospital unaccompanied. *Place of residence:* Patients living in the north have for the most part further to travel for treatment than those in central Israel, which inevitably delays their admission to hospital. Because of the distances involved and other factors the ambulance service in the north is inferior, either taking a long time to arrive or being totally unavailable. Patients say: "I can get myself to the hospital quicker than the ambulance can."

## DISCUSSION

Barriers to the effective implementation of QIs are to be found, this study finds, all across the health care system—in system resources, in staffing numbers, training and coordination, and in the patient population. But before discussing these barriers let us first review the results to date (in as far as they are known) of the Ministry of Health's two long-term efforts (a) to implement QIs in AIS care and (b) to reduce inequalities and cultural maladaptions (increase 'cultural congruence') in Israeli healthcare generally. In 2013, as noted earlier, only 13% of hospitalized AIS patients were administered a cranial CT scan within 25 minutes of admission: by 2016 the proportion had risen to 26%. In 2013 less than 25% of patients eligible for thrombolytic treatment received IV-tPA within an hour of admission. By 2016 the proportion had climbed to 40% (ISRAEL NEUROLOGICAL ASSOCIATION, 2016). An internal IPHCQI report shows that in 2014 the absolute number of patients receiving either IV-tPA or CAC within the permissible treatment 'window' had climbed from 305 in 2013 to 857 in 2015. These results confirm the trend that the IPHCQI has noted in AIS QI data submitted by almost all hospitals, namely that measurements of all the five new indicators are steadily rising. This Israeli instance of a QI strategy seems then to be working—so far—as planned. The counter-arguments to reliance on QIs for care improvement are well-known (Brezis, Cohen, Frankel, and Chinitz, 2012; Fisher, Moores, Alsharif, and Paganini-Hill, 2015; Gross, Tabenkin, and Brammli-Greenberg, 2007). But Israeli policy makers were persuaded that they had the powers to realise the De Vos strategy for the thorough assimilation of QIs (De Vos *et al.*, 2009)(see above pp. 2-3) and the Ministry also profited from lessons learnt in its earlier drive to deploy QIs to reduce 'door-to-balloon time' in acute myocardial infarction. So far, so effective. But this QI strategy also received a strong helping hand from the concurrent anti-inequalities drive initiated in 2011.

Forms and information leaflets have been translated into Arabic, Ethiopian Amharic, Russian and other necessary languages. Expanded interpreter services have been made available. Primary and secondary care staff are undergoing training to make their work more culturally congruent. Out-of-pocket payments from patients have been cut back. Formerly *discretionary* services have been transferred to the *compulsory* national basket of services. Additional healthcare staff have been recruited for the North and South and both regions have been accorded priority for future new facilities and advanced equipment—witness, the first CAC unit has been opened in the North (in 2016). The HMOs have been prodded into action too. The capitation formula for the allocation of HMO tax revenue has been further modified to take account of expanded/improved provision to socioeconomically deprived client groups. A knowledge base on access inequalities has been set up and senior managers across the HMO-delivered healthcare system have been made aware of effective ways to target these gaps.

The combined success of these two campaigns is, however, put in proportion by the first data to emerge from the as yet unpublished quantitative section of the present study. Analysis of a sample of 120 hospitalized stroke sufferers from the North and Central regions show that whereas 48% of Centre region residents have been evaluated as 'functioning well' three months after their stroke, the corresponding figure for Northern region residents is 16%. Whereas 86% of stroke sufferers admitted to Central region hospitals were administered tPA or CAC, only 49% of those admitted to Northern hospitals were. Across the sample, of all those *not* administered tPA, 84% live in the North. So progress is being made but there is still a long way to go and the MoH has to decide on the directions for investment from this point on. The part played by regional inequalities in creating the barriers to attaining higher quality care—the second aim of this study—is very pertinent to the issue of where and how available funding should be spent.

### Periphery vs. Centre

The disparities in healthcare access and availability between the Centre and the North are not thought by Israeli scholars to be the outcome of any ethno-religious discrimination but of the neglect of socio-economic and socio-geographic disparities (Averbuch and Avni, 2016; Averbuch, Dobrin, and Admon, 2015). It is evident that minimizing the financial obstacle to individuals' healthcare access by making it largely free at the point of service is not enough if other access-side factors—the physical distance to treatment, an inadequate ambulance service—and supply-side shortcomings—in the quantity and distribution of services—are not addressed.

Clearly, many population groups fall through the cracks if provision is not specifically targeted at them. However, there is a positive aspect to these differential treatment outcomes in periphery and centre—it points the way to a relatively low-cost investment path. Closing these inter-regional gaps will bring the greatest benefit to the greatest number because all shortages and inadequacies of access and supply have been shown to be much worse in the North than in the Centre. Closing these gaps should, therefore, generate the greatest positive effect on national treatment process and outcome rates. It is also probably the cheapest direction of investment because it is, mainly, not the latest and most

expensive technological advances that are needed but basic care elements — shorter ambulance times, setting up tPA units in Nazereth (whose hospitals serve much of the Arab population of the north), upgrading residential and home-delivered rehabilitation services (adding to the one CAC facility in the North is a more costly requirement). Delivering treatment in the North instead of transporting Northern residents to the Centre will also relieve some of the burden on Centre facilities. It also has to be noted that the progress achieved so far is almost entirely the fruit of a re-direction and re-allocation of central government funding, not of new funding and the prospect of substantial new funding for healthcare seems small. It is important therefore that significantly improving national stroke recovery and rehabilitation rates by addressing regional supply disparities can be a relatively low-cost option.

### The main barriers to the effective implementation of care quality indicators

Table 2 shows that the barriers to indicator effectiveness come in all sizes. There are the two ‘elephants’ of general resource shortages and public ignorance, but many experienced staffers also point to much more limited obstructions which nonetheless baulk large. For instance, when radiologists are not physically in the hospital it is hard to track them down to get answers to urgent questions. Stroke care protocols need to be modified to take account of the technologies available in a given hospital. This further demonstrates how in a climate of static funding there are relatively inexpensive advances to be made.

**Knowledge barriers:** The public’s unawareness of stroke and its symptoms is largely a problem of public education. Although the value of public information campaigns has been questioned (Gache *et al.*, 2014), making use of multiple information media, including the ‘social media’ and tailoring the campaigns tightly to carefully selected audiences—another opportunity for the application of cultural congruence techniques— would seem to offer good chances of making a significant impression.

**Resource shortages and resource organization:** Another direction of relatively inexpensive attack is to improve the coordination and organization of existing resources. The importance of the continuity of measurement and data transfer across all care and treatment sectors is insufficiently recognised. Patchy staff-staff communications is only partly an inter-personal problem. Staff across the different sectors are not sufficiently organized and trained to know how their sector does and can contribute to the effectiveness of other sectors. Ambulance crews, as noted, often do not warn the hospital that an AIS case is on the way or fail to register the precise time of symptom onset. Yet, it has been shown that regular positive feedback to ambulance crews from the hospitals they serve is a strong incentive to the crews to accelerate and upgrade their service (Jauch *et al.*, 2013; Lin *et al.*, 2012).

**Socio-geographic and socio-economic barriers:** One of the most important contributions of the present study is that it has uncovered three different areas of serious neglect and unintended discrimination in Israeli AIS care. Two of these— regional disparities and inadequate cultural congruence—are already being acted on but the third—age discrimination—is still to be addressed. Stroke sufferers over 60 are evidently being given inferior care despite Israeli Neurological

Association guidelines for the administration of thrombolytic and invasive stroke treatments stating firmly that “there are no contraindications by patient age for the administration of these treatments although care needs to be taken with respect to the danger of haemorrhages and other complications”.

### Limitations of the study

The chief limitation of the present study is that it pays too little attention to the pre-hospital and post-hospital phases of stroke care. No ambulance or rehabilitation staff were interviewed and this is an obvious next step. Although staffs from only three hospitals were interviewed there is no reason to doubt that the findings are applicable across the country and that the same disparities obtain between all peripheral regions and the Centre. The similarities between the findings of this Israeli study and a very similar French study (Gache *et al.*, 2014) indicates that some of the findings and lessons of the present study may also be applicable to other national healthcare systems.

### Conclusion and Implications for practice

- There is a clear limit to the improvement in AIS care the implementation of care indicators can achieve by itself. Two of the heaviest barriers to improved stroke care are manpower and material shortages and a lack of stroke-awareness in the general public, both irreducible by any care quality indicator.
- The effort to close the inter-regional gaps has to be maintained, as success in this will have the greatest effect on national treatment outcome rates for the lowest investment.
- There are numerous relatively cheap investment targets which would probably make a disproportionate impact on national outcomes data. Ambulance services in the North is one. *‘If ambulance crews could be brought to a good level of stroke diagnosis that would without doubt improve things enormously.’* Equipping the Nazareth hospitals with tPA facilities is another.
- All QIs are interdependent. For example, the lack of good-quality rehabilitation care in northern Israel means that even high-quality hospital treatment there loses value when the disability that many stroke sufferers still have on discharge is not repaired. This interdependence of treatment sectors means that Israeli policy makers need to move to a national strategy of Integrated Care Pathways.
- 50% of stroke victims are still arriving late to hospital care. Culturally adapted information campaigns are indispensable.
- Given the limitations of the present study (see above) and the fact that two components of the full study (quantitative measurement of the care received in all care phases and the views of stroke sufferers on the care received) have yet to be fully analysed and published, it is likely that more barriers to QIs and gaps in provision will be found. It will be interesting to see how far they confirm the conclusions from this analysis of the qualitative data.

**Declarations:** Ethics Approval for the study: The present study required the submission of a detailed request to the Helsinki Committee for medical research in each of the participating hospitals (Assaf Harofeh Medical Center, Tzrifin; Ziv Medical Center, Safed and Holy family Hospital, Nazareth). The Committee's approval allows researchers to

both publish their findings at national level and submit their findings and recommendations to official bodies for their potential implementation. Each hospital gave its approval within a month of submission of the application.

- **Consent to publication:** Not applicable
- **Availability of data:** The datasets used and/or analysed for the present study are available from the corresponding author on reasonable request.
- **Competing interests:** The authors declare that they have no competing interests.
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