

Overview of the recent developments and outcomes of stroke care in Alberta

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Table of contents

	Page
Table of abbreviations	3
1. Introduction	4
1.1 Methodology	5
2. Telemedicine	6
2.1 Telehealth in Alberta	6
3. Stroke Strategy	8
3.1 Canada and Alberta	8
3.2 APSS	9
3.2.1 Innovations and changes due to APSS	10
3.2.2 The effect on outcome of the implementation of APSS	11
3.2.3 Satisfaction of specialists	12
3.2.4 Costs and funding	13
3.2.5 Future perspective of APSS	13
3.2.6 Future planning of AHW and AHS & APSS	13
4. Conclusion	15
References	16

Table of abbreviations and Glossary ¹

AHS	Alberta Health Services Delivery arm of health care in Alberta. Reports to AHW
AHW	Alberta Health and Wellness Department of the government of Alberta
APSS	Alberta Provincial Stroke Strategy The APSS is a collaborative partnership between AHW and AHS, the Heart & Stroke Foundation of Alberta, NWT & Nunavut. The goal is enhance stroke prevention, services and provide a coordinated and integrated approach to care across the province.
CEO	Chief Executive Officer
CSC	Comprehensive stroke centre A CSC is a tertiary hospital that provides a full range of stroke services, including: CT-scan availability, Door to CT time less than 20 minutes with pre-alert, stroke team on-site, neuro-interventionist expertise on-site, central hub of stroke neurologist expertise in a telestroke network.
CT	Computerized tomography
ED	Emergency Department
EMS	Emergency Medical Services EMS are health care professionals who provide pre-hospital assessment, treatment and transport of patients.
GOe	Global Observatory for eHealth
GP	General Practitioner. Also known as Family Physician.
ICT	Information and communication technologies
OECD	Organisation for Economic Co-operation and Development
PSC	Primary Stroke Centre PSC is a hospital that provides the following stroke services: CT availability, door to CT time less than 20 minutes with pre-alert, stroke expertise on-site or available by telestroke link to a CSC, tPA treatment availability, serves communities in closest proximity.
TIA	Transient Ischemic Attack A TIA occurs when a clot stops blood flow to the brain for a short time. Symptoms resolve completely within 24 hours.
tPA	Tissue plasminogen activator tPA is a thrombolytic agent
WHO	World Health Organization

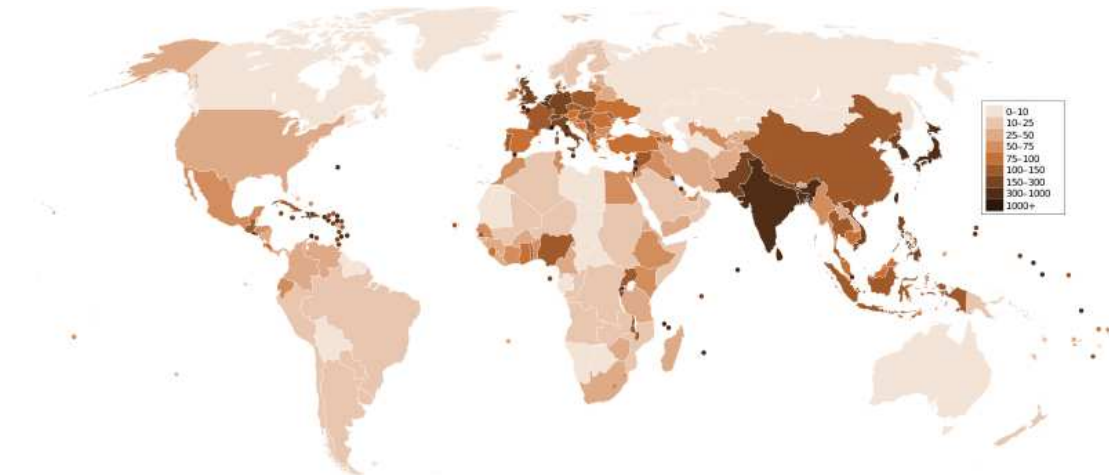
1. Introduction

This report gives a brief overview of telemedicine, and telemedicine in Alberta as an introduction to the main content of the report: an overview of the recent developments and outcomes of stroke care in Alberta. The Alberta Provincial Stroke Strategy (APSS) is a relatively new strategy to stroke using telemedicine and with amazing outcomes for patients and costs.

Ischemic stroke and Transient Ischemic Attacks (TIA) are diseases which are best treated by early administration of thrombolytic agents. The sooner the administration the better the outcome. Before such a drug can be given to a patient, diagnosis and diagnostic imaging are needed. Therefore there are different parts in the process of stroke care addressed by APSS to influence stroke outcome, such as the time of patient arrival to the hospital, the time from arriving to diagnostic imaging and treatment.¹

Alberta has a low population density with many remote areas. Only 4 hospitals have neurologists to serve a population of 3.7 million Albertans, and inhabitants of the northern Canadian territories. Canada has an aging population and challenges with increasing unhealthy behaviour and lifestyle of its population. The demographics are likely to cause a higher incidence of stroke and other chronic diseases. Nationally the same trends are seen and a national initiative to improve stroke care was set up.

Canada is a big country with a low population density of 3 inhabitants per square kilometre², whereas the Netherlands and other European countries have a population density of 400 inhabitants per square kilometre (see map: population density 2006). This means that the majority of Canadian people live far away from hospital and other care. Especially the northern parts of the country have few facilities. The number of remote communities makes telehealth to link experts with patients extremely useful in Canada. It reduces travel costs and time and gives experts a larger geographical area to cover.³



Following the creation of the Canadian Stroke Strategy the province of Alberta developed the Alberta Provincial Stroke Strategy. APSS concentrates on health promotion, disease prevention, acute care, rehabilitation and community reintegration. Also a part of APSS is evaluation and quality improvement to keep improving stroke care, and to identify and address bottlenecks in the system. Part of the APSS is the use of telestroke. Telestroke in

Alberta is the use of technology to link Primary Stroke Centres to stroke experts in one of the two comprehensive stroke centres¹.

1.1 Methodology

This report is the final product of Emma van Bussel's public health internship. For the preparations and feedback on this report, she worked with Prof. Guus Schrijvers to set up a plan of investigating the recent developments of stroke care in Alberta, and the role of telestroke in stroke care. Sherry Thompson connected her with Dr. Tom Jeerakathil who Emma shadowed during one week while he performed stroke and acute telestroke care in the University of Alberta Hospital in Edmonton. To see outpatient telestroke care Emma spent a second week in the AH Owen Stroke Prevention Clinic of the University Hospital, where some patients are seen using telestroke technology.

An interview with Tom Jeerakathil Chair of the Evaluation and Quality Improvement Pillar of the APSS, discussions with other doctors involved in the program, and the APSS interim evaluation report are the sources for most of the information in this report. Background information was obtained from other literature on telemedicine, telemedicine in Canada and stroke care in Alberta.

2. Telemedicine

The WHO recognized the potential of telemedicine to address some of the challenges faced by developed and developing countries in providing accessible, cost-effective, high-quality care services.⁴ In 2005 the WHO established a new workgroup *Global Observatory for eHealth (GOe)* to investigate the needs, opportunities and developments in eHealth. In 2009 a report on country profiles of participating countries came out by the GOe.⁵ A profile of Canada is part of this report. The Netherlands didn't join.

EHealth is the use of information and communication technologies (ICT) for health. WHO distinguishes eHealth tools and eHealth services (see box below), and asked all its members to respond on how useful the tools and services would be for the country. All tools, except from the GP Information Systems and the Geographical information system were rated by at least 50% of OECD countries as very useful or extremely useful.

Please rate the following list of **eHealth tools** on the basis of how useful they would be if WHO could offer generic prototypes for adaptation by your country.

- Electronic Health Records (EHR)
- Patient Information Systems (PIS)
- Hospital Information Systems (HIS)
- General Practitioner Information Systems (GPIS)
- National electronic registries
- National drug registries
- Directories of healthcare professionals and institutions
- Decision Support Systems (DSS)
- Telehealth
- Geographical Information Systems (GIS)
- Other, please specify

Which of the following **eHealth services** does your country require from WHO and please grade their usefulness.

- Advice on national needs assessment for eHealth
- Advice on eHealth policy and strategy
- Advice on methods for monitoring and evaluation of eHealth services
- Information on effective/best eHealth practices
- Advice on eHealth norms and standards
- Information on trends and developments in eHealth
- Advice on eLearning programmes
- Advice on human resources development for eHealth
- Other, please specify

Telehealth as defined by the WHO “is the use of ICT to either support the provision of health care or as an alternative to direct professional care. It encompasses telemedicine and the use of remote medical expertise.”⁶

2.1 Telehealth in Alberta

According to the department of Health and Wellness of the Government of Alberta (AHW), Alberta has one of the largest and best integrated telehealth networks of North America. Alberta uses videoconferencing technology to connect Albertans with health care providers, and to connect healthcare providers with each other. Not only physicians use telehealth, the technology is also used to deliver education and administrative activities at a distance. At the

start of 2011, across Alberta there are over 900 videoconferencing sites, the system is secure and confidential. Alberta's biggest driver for telehealth is to address the inequities between urban and rural citizens for access to effective, efficient health services.³ Since 2009 Alberta Health Services (AHS) is responsible for Telehealth in Alberta. Telehealth is supported through donor contributions, AHW, AHS, Health Canada First Nation and Inuit Health Branch and Canada Health Infoway strategic investments.

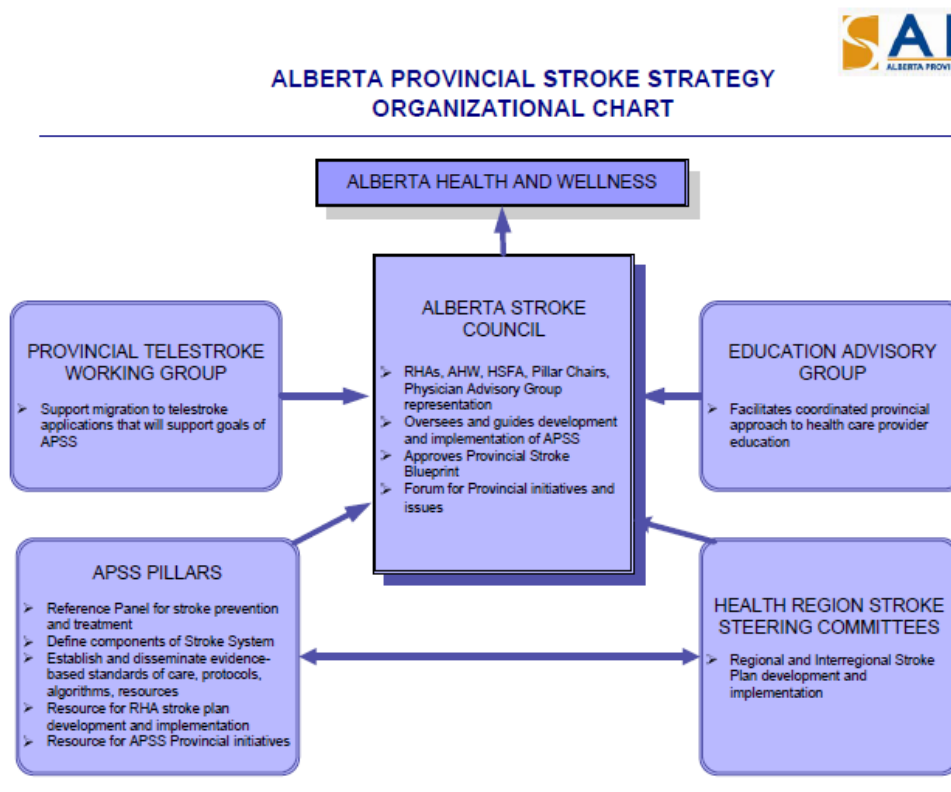
The initiative to improve stroke care in Alberta *The Alberta Provincial Stroke Strategy* includes one of Alberta's biggest telehealth initiatives: Telestroke. Besides the use of telehealth in stroke care to remove health-access inequities, the programs goals are to improve stroke prevention and stroke care in the province.

3. Stroke Strategy

3.1 Canada and Alberta

The Canadian stroke strategy launched in 2005 and modelled on a successful provincial effort in Ontario, as an idea and partnership between the Canadian Stroke Network and the Heart and Stroke Foundation. Now the federal government as well as all provincial governments are involved to make stroke care move to improvement.^{7,8} The Canadian Stroke Strategy mobilized key stakeholders in every province to ensure the best research findings were being moved into practice in the health system. At a national level Canadian best practice recommendations for stroke care were developed, and updated at a regular basis. These recommendations describe optimal care for stroke patients and best-practices for stroke prevention, medical care and recovery.⁷ With these recommendations as a guideline provinces built their own protocols.

Ontario was in 2000 the first province to launch a provincial stroke strategy.⁷ In Alberta the first attempt to start a province wide stroke strategy stalled, but in 2005 Alberta followed with a solid stroke strategy; the Alberta Provincial Stroke Strategy. After the government of



Alberta committed a two year funding of 20 million CAD a business plan was made. Since AHS didn't exist in 2005 the Alberta Stroke Council had to collaborate with the 9 health regions that preceded AHS, to make the strategy a success. The Alberta Stroke Council is a collaboration of stakeholders in stroke care in Alberta – see chart⁹: AHW, AHS, the Heart & Stroke Foundation of Alberta, NWT & Nunavut and clinical experts.¹ At the start not all regions saw the importance of better stroke care and some did not identify it as a priority. These regions needed extra effort to join APSS to provincially improve stroke services.

The national report *The Quality of Stroke Care in Canada*⁷ published June 2011 shows that Alberta scores high compared to other provinces on the provincial key indicators for stroke care. Data are from the year 2008/2009 and Alberta scores second in 'arriving within 3.5

hours after symptom onset' with 38% and an average of 34% in Canada. Alberta is number one with 32% of stroke patients receiving a CT or MRI scan within one hour of arrival, the Canadian average is 22%. Twelve percent of patients with ischemic stroke received tPA, compared with 8% on average. With 52% Alberta has the highest rate of patients admitted to a stroke unit, which is proven to give better outcomes, compared to a Canadian average of 23%. Alberta is also above average (with 64% number four out of ten provinces) with the percentage of patients going back to their home after discharge. Although the data of the provinces are not completely comparable this shows that Alberta is doing well regarding stroke care. According to Dr. Jeerakathil prior to 2005 Alberta did not score so well compared to other provinces.

3.2 Alberta Provincial Stroke Strategy

Alberta has two big cities and four hospitals with neurologists; Edmonton, Calgary, Red Deer and Lethbridge. Before the reformation in stroke care, started in 2006 by APSS, there were these four hospitals and a hospital in Grande Prairie providing thrombolytic drugs to stroke patients. Other people in Alberta, and the North West territories, Yukon and northern British Columbia had to travel all the way to Edmonton to see a neurologist. In acute stroke situations their chance for thrombolysis was low only because of the distance to the nearest hospital with the right expertise and equipment. People from Yellowknife in the North-West Territories live about 1500 kilometre from Edmonton, where the nearest neurologist is located.



APSS was first initiated in 2005 to meet the governmental (AHW) core business goals and strategies, including advocating a healthier lifestyle, improving health protection with screening and prevention services, improving access to health services and improve the outcome of health services by managing chronic conditions. APSS is a provincial counterpart of the Canadian stroke Strategy.

APSS concentrates on health promotion, disease prevention, acute care, rehabilitation and community reintegration. Also a part of APSS, is evaluation and quality improvement to keep improving stroke care, and identify and address bottlenecks in the system.¹

3.2.1 Innovations and changes due to APSS

Due to APSS care providers of all areas involved with stroke patients in Alberta now are involved and educated in improving stroke care, and facilities have been set up where necessary. Additionally a database is set up to measure patient flow, outcome and costs of stroke care.

Ischemic stroke is best treated by administering the thrombolytic agent tPA (tissue plasminogen activator) within 4.5 hours after the onset of symptoms, and the benefit is greater with earlier treatment. To improve the percentage of patients who can receive this treatment the time of people entering the hospital after symptom onset was decreased, by increasing the awareness of citizens of recognition of stroke symptoms and importance of early treatment. Citizen awareness was increased by awareness campaigns. EMS personnel were trained to recognize the symptoms and to bypass small hospitals without the facility of thrombolytic drugs.¹

The number of primary stroke centres was increased from three to 14 by training the staff in neurologic examinations, and administering of tPA and providing CT scan abilities in all sites. Protocols for diagnostic tests, admission to a stroke unit, treatment and rehabilitation and specialized stroke care after discharge were developed in Alberta, consistent with the Canadian Best Practice Recommendations for Stroke Care.⁷

To improve the door to treatment time of people with stroke, more regional hospitals got CT scanning capabilities, their health professionals have been trained and they now have the ability to provide thrombolytic drugs. Telestroke equipment has been implemented in the PSCs and the CSCs to enable video-consultation of stroke professionals in Edmonton and Calgary. Patients in rural areas can now be treated by their local doctors for stroke in regional hospitals. This system creates a faster treatment and therefore better patient outcome, and less costly transports.



For the follow up of stroke and TIA patients specialists in the two comprehensive stroke centres have the ability to see their patients via videoconferencing. The patients can visit a clinic with videoconferencing ability close to their home, and achieve specialized care without travelling. There are about 50 telehealth sites across the area APSS covers, these are part of Alberta's telehealth project, and are not solely used for stroke care. In most cases there is a nurse or APSS coordinator at the patients' site to facilitate the consultation by helping with the physical examination – instructed by the expert in Edmonton- and who takes care of

execution of tests ordered by the doctor. Not all videoconferencing sites have such personnel to accompany the patient.

For acute stroke consultation the patient's own doctor in an emergency room of one of the primary stroke centres shows the patient via videoconferencing, and presents anamnesis and examination to the stroke expert in the comprehensive centre. The stroke specialist confirms the patient's status by doing a neurologic examination using the technologies to instruct the patient and see his or her reaction and capabilities. The expert then can decide whether or not thrombolytic drugs should be administered, and the non-neurologist doctor performs it.¹⁰

3.2.2 The effect on outcome of the implementation of APSS

At the start of implementation the evaluation and quality improvement pillar of APSS put effort in creating a database to track improvement in stroke care inside and outside the hospital. The database is built with billing data from physicians and hospitals, and owned by AHS-analysts. The evaluation and quality improvement pillar of APSS has access to all anonymized information. With the database set up, measuring now and into the future is guaranteed.

The progress made in stroke services through all areas of the program will be summarised here. The findings showed here are derived from the *APSS interim evaluation* report published in December 2010.¹

Educating Albertans

At the beginning of the implementation of APSS, in 2007, a public awareness campaign was established, and in 2009 and 2011 more campaigns were released. The effects of public awareness measured by the following outcomes show a significant effect in the arrival at the emergency department (ED). Surveys before and after the first two campaigns show a 4-13% increase in awareness of specific symptoms of stroke, but the awareness declined between the campaigns. The median time from symptom onset or last seen well, to emergency department arrival decreased by 62 minutes for Transient Ischemic Attack (TIA) and by 31 minutes for stroke patients. With this the proportion of patients who arrived within the treatable time window increased significantly.

Reducing stroke occurrence and mortality

To prevent new strokes or TIAs in patients who came to the hospital with this disease, tertiary prevention is important. Since the launch of APSS there was an improvement in prescription of thrombotic agents at discharge from hospital in patients without atrial fibrillation from 64% to 75%. Lipid lowering drug prescriptions at discharge increased with 15%. The prescription at discharge of antihypertensive agents for patients with ischemic stroke did not increase, but was with 72% relatively high at baseline.

Between 2004/05 and 2008/09 there was a 23% decline of emergency department and inpatient hospital visits for stroke, and in-hospital mortality for ischemic and haemorrhagic stroke reduced with 27%.

Improving access to best care

To improve access to stroke professionals eleven centres how can provide stroke care were added and a physician TIA Hotline was implemented to facilitate urgent access to specialist consultation, diagnostic imaging and stroke prevention measures. The hotline is 24 hours per day available, and contacts callers from Northern Alberta to a specialist in Edmonton, and callers from Southern Alberta to a specialist in Calgary.

The proportion of patients receiving thrombolytic agent in the acute phase of ischemic stroke or TIA increased from 4.9% to 7.6%. The median time between arriving at the ED and treatment decreased by 10 minutes.

The inpatient stroke care changed to more CT scans and carotid arteries imaging for TIA and stroke patients, and more patients were receiving care on a stroke unit. Prevalence of potentially preventable complications of these patients as pneumonia and urinary tract infections did not change.

The proportion of ischemic stroke and TIA survivors discharged back to their pre-admission residence increased significantly from 77% to 80.8%, this means that over 160 Albertans were able to avoid a major increase in the level of care they require.

Referrals to Stroke Prevention Clinics and the number of those clinics for ischemic stroke and TIA survivors increased since the start of APSS. Still only 51% of patients had a documented referral by 2007/08.

Improving health care system efficiency

To improve efficiency in Stroke care, emergency medical services now have a protocol to divert patient direct to primary stroke centres if stroke or TIA is suspected. Due to the increased capacity of rural centres to manage stroke patients, there has been a 29% reduction in transfers of patients from rural areas to tertiary care EDs. Annual savings in EMS transfer costs are likely to be more than \$90,000 per year.

Despite the aging population there has been reduction in stroke patients presenting to EDs and admitting to hospitals. The reduction in hospital admissions has resulted in a \$22 million decrease in the annual costs of stroke in the province. Cost savings from use of thrombolytic agents, and with that a better outcome, was estimated to be \$141,000 in the year 2004/2005 and \$174,000 in 2007/08.

Improving satisfaction

The overall satisfaction of inpatients stroke care was stable with 95% of people being moderately to very satisfied from 2007 to 2009. The satisfaction of care after leaving the hospital was 75% in 2007 and increased to 85% in 2009, after addressing a number of community support services.

3.2.3 Satisfaction of specialists

For the telestroke specialists in Edmonton seeing patients via videoconferencing is not affecting the efficiency or quality of care they deliver. Neurological examination for acute patients is with help from the local doctor complete. For the decision whether to start tPA or not neurologists use the NIH scoring scale, on which a reliable impression can be derived using videoconferencing. Most neurological tests used in follow up-patients are accomplishable, when necessary these patients can come to a comprehensive stroke centre for their next appointment. Equipment works in general well, and problems are solved quickly. The stroke-specialists have access to the blood work and brain imaging of the patient and can take over the control of the camera at the videoconferencing site to adjust the camera as needed for the examination.

For acute stroke care there is always a stroke specialist on call in as well Edmonton as Calgary. In Edmonton the telestroke calls, on top of the regular work asks good planning of the physician to do all work properly. Although it's hard work, it works out well. An extra stroke specialist to lower the pressure for physicians on call might solve this, but due to a complicated system to hire staff this is impossible for the coming time. I have no information on the pressure of work in Calgary, where more stroke specialists are than in Edmonton.

3.2.4 Costs and funding

The vision and targets of APSS align with AHS and AHWs vision and targets in *Becoming the Best 5 year health action plan*¹¹, and therefore these organisations has given and will give APSS financial support. In 2005 a two year funding commitment to APSS of 20 million CAD in total was made, which the Alberta Government renewed in 2008 with 22.5 million CAD for the next three years. When the current funding expires in 2012 AHS will take over the funding to APSS.¹² The funding has been ample and covered new investments, sustaining of achieved infrastructure and equipment and investments in the start of addressing recommendations made in the APSS interim evaluation report.

As mentioned above (estimated) savings have been and are continued made since the implementation of APSS, these savings exceed the 42.5 million investment of the government in APSS.

3.2.5 Future perspective of Telestroke

Dr Tom Jeerakathil, chair of the evaluation and quality improvement pillar of APSS and (tele)stroke specialist in Edmonton, has much confidence in the future of APSS. And so has Dr Khan, member of the second pillar of APSS and (tele)stroke specialist in Edmonton. The goals set in the business plan of APSS in 2005 are now achieved, some even with a large unexpected surplus. With AHS in place as a provincial coordinator in health, collaboration with the hospitals and other organizations in the zones is smooth.

In the near future APSS will work closer together with AHS and its 5 health regions. Data will be measured per region, and even per care-centre. This allows region and centre specific recommendations for more concrete advices for improvement. Goals for the regions, based on the recommendations of the *APSS interim evaluation report* will be set for a one year period. The evaluation and quality improvement pillar aims to meet the goals in every individual centre, in stead of on average in the province.

Improvements for the future are summed as 26 recommendations in the APSS interim evaluation report. Sites of improvements include increasing the number of stroke patients treated in stroke centres, increasing the percentage of inpatient rehabilitation and further increase in door-to-treatment time. A goal for the future is to provide all video conferencing sites with nursing/coordinating staff and/or reduce the number of sites for telehealth. A long-term goal is to expand the number of stroke-specialists in the Edmonton Comprehension centre, where there are now 5 specialist working with telestroke.

Although achieving the goals will need effort, Dr. Jeerakathil is optimistic for most of them. The possible threads are that it's hard to attract a new stroke specialist to reduce the workload in Edmonton because of the way of staff is financed (Alternate reimbursement plan) and accountability in this.

As the funding agreement of AHW ends APSS will be funded by AHS. With this APSS won't function as a workgroup anymore, but will be integrated in AHS's Clinical networks - a structure of engaging clinicians in health care improvement- and planning. A concern to this new structure is that APSS might loose its powerful collaboration with vice Presidents and CEO of AHS and AHW as it has now in the Alberta Stroke Council.¹³

3.2.6 Future planning in Alberta & Alberta Provincial Stroke Strategy

The APSS is set up by AHW, former AHS regions and the heart and stroke foundation of Alberta, NWT and Nunavut. The provincial government is been funding the initiative. Although the collaboration with AHW the planning and goals of APSS are not discussed or

clearly taken into the health-care planning reports of AHW or AHS. APSS and the 5 year health action plan align, in that three of the five action of the becoming the best action plan are addressed for stroke care in APSS. The three action are better prevention, better access to care and reduction in wait times. Prevention of stroke has a huge overlap with prevention for other chronic diseases as diabetes and hypertension, so the actions taken within APSS can be an example or basis to expand to address more chronic disease prevention.

APSS existed before *Vision 2020* and the *5-year health action plan* were made, the decision for the second fund to APSS may have a basis in the overall idea that prevention and access are targets in the province, but APSS isn't an effect of the future planning documents.

4. Conclusion

Telemedicine, the use of ICT for healthcare, gains worldwide ground. The WHO recognised that telemedicine is particularly useful for health delivery in remote areas. In Alberta, a province in Canada with many rural areas, the government invested 42.5 million Canadian Dollar in the Alberta Provincial Stroke Program (APSS) to improve stroke care in the province. APSS booked since its start good results regarding public awareness of stroke symptoms, reducing stroke occurrence, access to best care and health care system efficiency and public satisfaction. To improve accessibility and raise inequities APSS makes effectively use of telehealth equipment, this is especially in favour of people living in remote areas. APSS has made stroke care in Alberta of higher quality, better accessible, more efficient and so reduced the costs of stroke care. Since its start APSS reduced the number of emergency and inpatient hospital visits of stroke patients, it reduced the in-hospital deaths and improved access and efficiency in stroke care.

APSS realises that to sustain the achieved improvements there has to be continuing evaluations and measurements to address centres and inefficient structures. For the near future APSS has still goals to achieve to make stroke care and prevention even better. Funding is stable because the directions of APSS align with the directions of the one provincial health delivery organisation AHS, and AHS will fund APSS.

References

1. Jeerakathil T, Burridge D, Thompson G, Fang S, Hill M.D. The Alberta Provincial Stroke Strategy: Improving Stroke Care Across Alberta. Interim evaluation report. Edmonton: Alberta Provincial Stroke Strategy; December 2010.
2. StatCan. Population density, birth and deaths of selected countries. Available: <http://www40.statcan.gc.ca/101/cst01/demo01a-eng.htm>
3. Alberta Health and Wellness. www.health.alberta.ca. Alberta Telehealth. 2011. Available at: www.health.alberta.ca/initiatives/telehealth.html
4. WHO. Telemedicine: Opportunities and developments in Member States. Global Observatory for eHealth series – Volume 2. 2010
5. WHO. Atlas eHealth country profiles: based on the findings of the second global survey on eHealth. Global observatory for eHealth series Volume 1. 2010. Available: http://whqlibdoc.who.int/publications/2011/9789241564168_eng.pdf
6. Kay M, Olesen-Gratama van Andel M. eHealth Tools & Services: Needs of the Member States. Report of the WHO Global Observatory for eHealth. WHO 2006. Available: http://www.who.int/kms/initiatives/tools_and_services_final.pdf
7. Canadian stroke Network. The quality of stroke care in Alberta. 2011 Available: <http://www.canadianstrokenetwork.ca/wp-content/uploads/2011/06/QoSC-EN1.pdf> (June 28th 2011)
8. Website Canadian Stroke Strategy. Available: http://canadianstrokestrategy.com/?page_id=20 (June 27th 2011)
9. Alberta Provincial Stroke Strategy Organizational chart. Website of APSS. Available: http://www.strokestrategy.ab.ca/PDFs/APSS_Org_Chart.pdf (June 27th 2011)
10. Telestroke. Website of APSS. Available: <http://www.strokestrategy.ab.ca/telestroke.html> (June 28th, 2011)
11. Government of Alberta, Alberta Health Services. Becoming the Best: Alberta's 5-year health action plan 2010-2015. November 2010.
12. Health Report: Alberta Provincial Stroke Strategy. Presentation of APSS interim evaluation report on February 28 2011 by AHW minister Gene Zwozdesky, Chris Eagle CEO of AHS and Dr Tom Jeerakathil. Available via: <http://www.youtube.com/watch?v=R0cL6VhCSt0>
13. APSS. Alberta Stroke Council: terms of reference. Website APSS. Available: <http://www.strokestrategy.ab.ca/ASC%20TOR%20revised%20March2010.pdf> (June 27th 2011)

