

# Competitive Health Services in Sparsely Populated Areas – eHealth Applications across the Urban-Rural Dimension



## Implementation of the mobile eye unit “EyeMo” in Sweden

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# 1. Introduction

Competitive Health Services in Sparsely Populated Areas – e-Health Applications across the Urban-Rural Dimension is a three year project funded by European Union's 'Northern periphery programme' running between 01.01.2008 and 31.12.2010. The goal of the project is to increase access to health care services in the sparsely populated areas of northern periphery by transferring existing e-health innovations between participating countries. The participating partners are County Council of Västerbotten (Sweden), Northern Ostrobothnia Hospital District and University of Oulu (Finland), Norwegian Centre for Telemedicine and University Hospital of North Norway, University of Aberdeen and Centre for Rural Health (Scotland) and National University of Ireland.

The main goal of the project is to transfer successful e-health innovations between the participating countries. The County Council of Västerbotten, Sweden has during the project period piloted a mobile eye unit for screening of diabetic retinopathy originating from the Northern Ostrobothnia Hospital District, Finland.

## 1.2 EyeMo Mobile eye unit for screening of diabetic retinopathy

Diabetic retinopathy is damage to the retina caused by complications of diabetes mellitus, which can eventually lead to blindness. It is an ocular manifestation of systemic disease which affects up to 80% of all patients who have had diabetes for 10 years or more (Kertes, 2007). Research indicates that at least 90% of new cases could be reduced if there is proper and vigilant treatment and monitoring of the eyes. (Tapp et al. 2003).

The Northern Ostrobothnia Hospital District, Finland, has developed a mobile eye unit, EyeMo, a trailer designed to function as an on the road office for ophthalmology staff where they can examine patients for various eye conditions, including diabetic retinopathy. The mobile eye unit has been piloted in Sweden within the Competitive Health Services in Sparsely Populated Areas project.

For a decade staff at the Northern Ostrobothnia Hospital Districts ophthalmology unit in Finland have been travelling across rural areas of Northern Finland with a trailer fully equipped to do screenings for diabetic retinopathy and glaucoma follow-ups. Thousands of patients in Finland have been examined at the mobile eye unit saving time and effort by eliminating the need to travel for the patients, at the same time increasing screening volumes, and saving resources for the hospital district. Patient flow is high and the examinations performed at the mobile eye unit are of high quality. (Aikkila, 2009). The service is part of the standard services provided by the Oulu University Hospitals ophthalmology unit.

### 1.3 EyeMo in the County Council of Västerbotten, Sweden

Since frequent screenings have positive effect on detecting and treating diabetic retinopathy it is vital that people suffering from diabetes are screened regularly. The ophthalmology units within the County Council of Västerbotten, Sweden, perform thousands of screenings yearly but still have a need to increase screening volumes and increase access to screenings in the sparsely populated rural areas.

The prevalence of Diabetes Mellitus type 1 and type 2 is increasing in Sweden. There are over 11 000 people living in the County Council of Västerbotten who suffer from diabetes. Approximately 80% have type 2 Diabetes Mellitus and the remaining 20% suffer from Diabetes Mellitus type 1. According to the Swedish guidelines patients with type 1 diabetes need to be screened for diabetic retinopathy once a year and patients with type 2 diabetes are screened at least every three years. The County Council of Västerbotten has three ophthalmology units that perform screening of diabetic retinopathy. The units are located in Umeå, Skellefteå and in Lycksele.



In Sweden EyeMo has been tested during two pilot periods. The pilot has been hosted by Lycksele hospitals ophthalmology unit. The first period was in March 2010 and the second period in July 2010.

A total of 160 patients have been examined at the mobile eye unit. During the first pilot period patients living in Storuman commune were called for screening of diabetic retinopathy. During the second pilot period the patients living in the Vilhelmina commune were called.

### **1.3.1 Pilot in Storuman**

During the first pilot period the mobile eye unit was located at Storuman health centre, approximately 110 kilometres from Lycksele hospital. 80 patients were called for the examination. One nurse performed all of the examinations and documented the outcomes and stored the images in the electronic patient record system.

The second week of the first pilot period was scheduled to take place in Sorsele, located approximately 150 kilometres from Lycksele hospital. The staff was forced to cancel the pilot in Sorsele, since the mobile eye unit was damaged during the transport from Finland and it was not possible to move the mobile eye unit from Storuman to Sorsele health centre.

### **1.3.2 Pilot in Vilhelmina**

The second pilot period took place at Vilhelmina health centre, which is located 120 kilometres from Lycksele hospital. Eighty patients were examined at the mobile eye unit, an ophthalmology nurse performed all of the examinations and completed all documentation.

A total of 160 patients were screened for diabetic retinopathy during the two EyeMo pilot periods. The staff involved in the pilot are used to travelling to health centres in order to examine patients and have a very high competence. They have been doing diabetic retinopathy screenings for the past ten years and are trained in making first evaluations on the photographs taken during screenings.

## **2. Methods**

The ophthalmology nurses involved in the EyeMo project have been interviewed, prior, during and after pilot periods. The interviews have been semi-structured interviews and the results of the interviews have been utilized in planning for the pilot as well as in solving practical problems related to implementation of the mobile eye unit.

The e-health evaluation toolkit eHIT has been used by the staff involved in the project prior to launching the pilot, and after the first and the second pilot period. The results of the eHIT analysis have been used to prepare for the pilots and to solve problems staff members have experienced during the pilots.

A member of the project team was present during both pilot periods and carried out participatory observations. Informal interviews with patients and staff have been conducted as well as direct observations leading to field notes.

During the second pilot period all patients were given a questionnaire to take away. The aim of the questionnaire is to study how the patients felt about their visit at the mobile eye unit. The questionnaire includes open ended questions as well as multiple choice

questions. The results of the questionnaire are presented as summaries and as comments written by the patients.

### **3. Results**

#### **3.1 Staffs experiences of the mobile eye unit**

The mobile eye unit has been hosted by the Lycksele hospitals ophthalmology unit during both pilot periods. The ophthalmology nurses working with the pilot have vast experience on screening diabetic retinopathy and are used to working independently. The staff had a possibility to see the mobile eye unit before it was piloted in Sweden. The staff members did not require training on how to work at EyeMo, since the same medical equipment and computer systems were used at the mobile eye unit and at the ophthalmology unit.

The pilot has been appreciated by staff working at the ophthalmology unit in Lycksele. Overall the ophthalmology staff has found their participation in the pilot to be an interesting and a rewarding experience.

In order to have a good work-flow at the mobile eye unit it is necessary to have two staff members working at the unit. During the pilot period only one staff member from the ophthalmology unit was working at the trailer, supported by a member of the project team. Staff points out that entering the trailer is challenging for people with disabilities, and an additional staff member is required to be at the trailer to perform the arrival interviews and help patients with disabilities to get in the trailer.

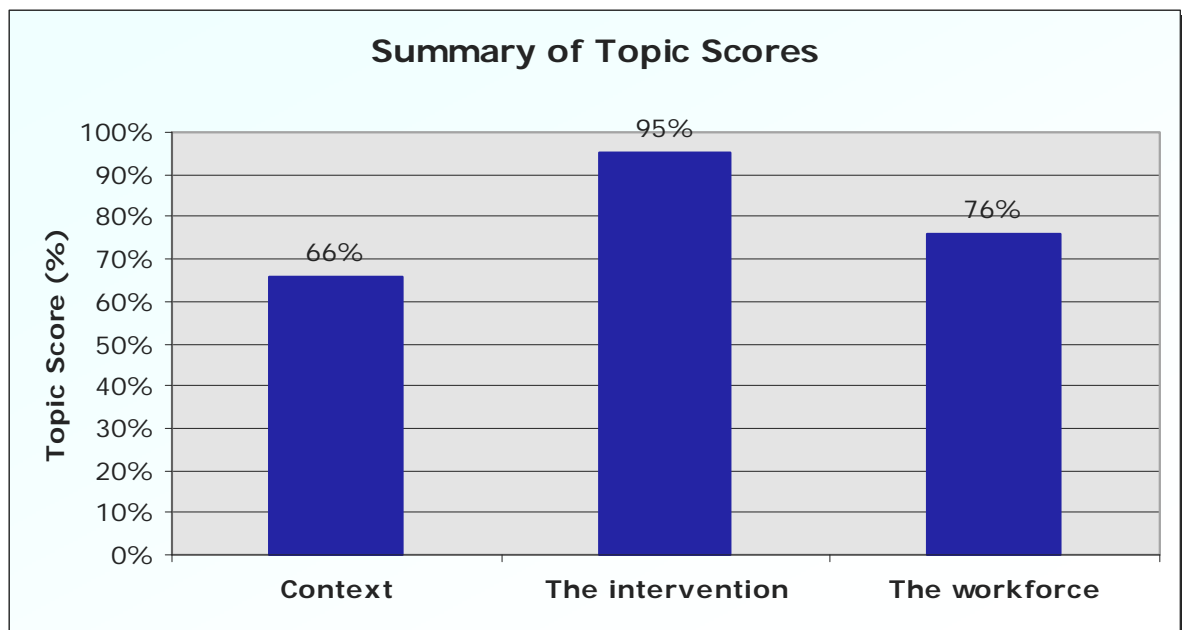
The staff also pointed out that the waiting room in the mobile eye unit is very small, when several patients arrived at the same time not all of the waiting patients were able to get in the mobile eye unit.

Sound isolation was also problematic, the walls are very thin and what is said in the examination room can be heard in the waiting room.

The staff appreciated the concept of EyeMo, having all of the necessary equipment in one place and being able to reach patients living in the sparsely populated remote areas is positive. The practical problems experienced during the pilot periods can be relatively easily solved if EyeMo becomes a part of the services the ophthalmology unit provides.

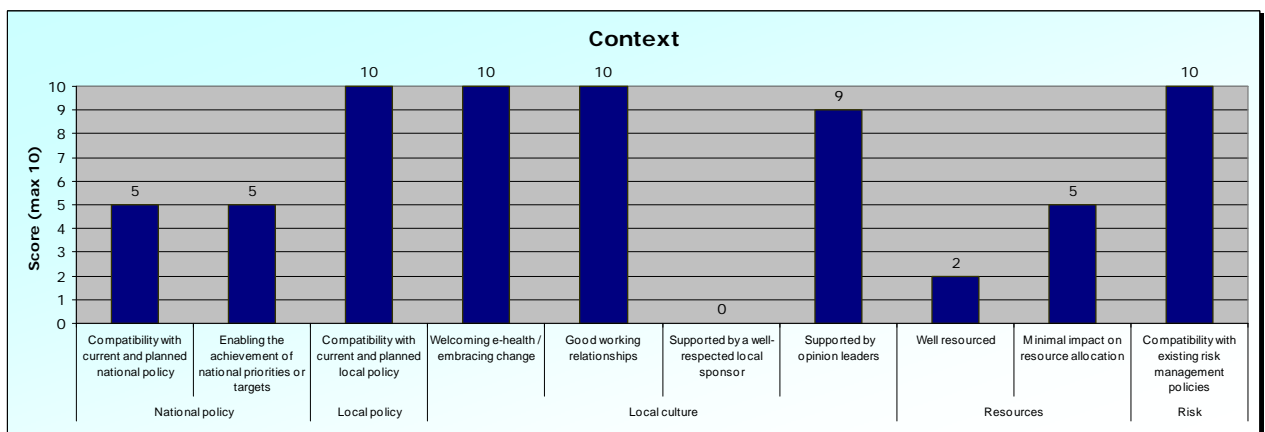
##### **3.1.1 eHIT results on EyeMo, post-implementation**

An eHIT analysis on EyeMo was completed by the manager of the ophthalmology unit in the end of the EyeMo pilot. The results on the eHIT analysis are presented next.



**Table 1.** eHIT summary of topic scores

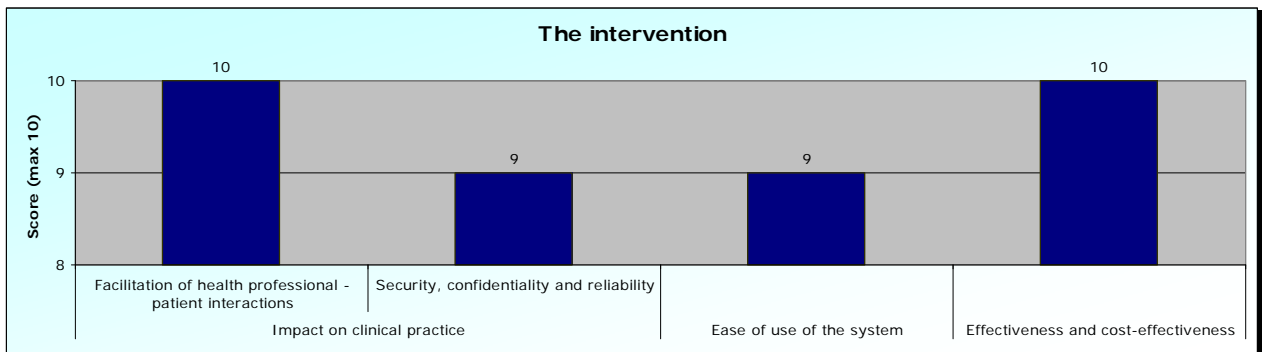
The topic summary gives scores of 66% on context, 95% on the intervention and 76% on the workforce after the service has been piloted, in comparison to 66% on context, 93% on the intervention and 81% on the workforce prior to implementation. The score on context has not been affected by the implementation. Scores on context and the workforce have increased slightly, since the implementation.



**Table 2.** The context

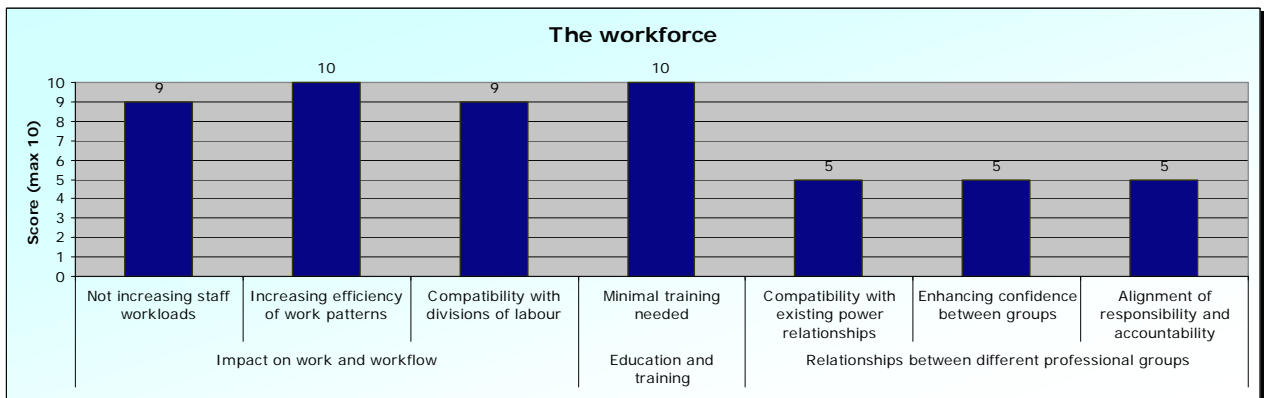
The context section of the eHIT tool highlights the problems the ophthalmology unit has when it comes to having the necessary resources available for implementing EyeMo. The unit has no resources for building a mobile eye unit and no resources for running the service. By the time the eHIT tool was used it was not decided whether or not the County Council of Västerbotten will be able to make EyeMo a part of the standard services provided by the county's ophthalmology units. The mobile eye unit is

compatible with the local and national policies and targets and risk management policies and scores high on all of these areas.



**Table 3.** The intervention

The respondents give high scores on all of the topics on the intervention section. The service is perceived as secure and effective. It also facilitates interaction between health professionals and patients, mainly by allowing increased access to diabetic retinopathy screenings and shortening waiting periods for the patients. The total score of the intervention section is 95%. Data security is high since the secure hospital network is used for all information exchange. In general, the mobile eye unit has the same equipment the staff is used to using at the local ophthalmology unit resulting in a high score when it comes to ease of use of the system. Effectiveness and cost-effectiveness also score high due to high screening capacity and saved costs regarding travel.



**Table 4.** The workforce

The implementation of EyeMo has not affected the relationships between different professional groups. The staff involved in performing diabetic retinopathy screenings has worked together for years and the ophthalmology unit has very informal hierarchy. The implementation of the mobile eye unit does not affect alignment of responsibility or accountability leading to the neutral score of 5. The staff's work patterns, workload and the division of labour are not negatively impacted by implementation. The need for training staff is minimal when it comes to performing clinical work at the mobile eye

unit, problems do however rise when it comes to transporting the unit between communes. None of the staff members at Lycksele hospital has the necessary qualifications needed to transport the trailer, further training and licensing is needed in order to the ophthalmology unit to be able to provide the service. Some training is required when it comes to setting up the mobile eye unit at remote locations and when it comes to accessing the County Councils secure network from the mobile eye unit.

Topic	Sub-topic	Score	Comments
National policy	Compatibility with current and planned national policy	5	
	Enabling the achievement of national priorities or targets	5	
Local policy	Compatibility with current and planned local policy	10	
Local culture	Welcoming e-Health / embracing change	10	
	Good working relationships	10	
	Supported by a well-respected local sponsor	0	Not at this moment, if we want to continue with EyeMo I don't know if it would be supported, who would pay for it?
	Supported by opinion leaders	9	
Resources	Well resourced	2	The ophthalmology unit at Lycksele hospital cannot afford to build a trailer.
	Minimal impact on resource allocation	5	
Risk	Compatibility with existing risk management policies	10	

**Table 5.** Summary of comments, the context.

The Intervention			
Impact on clinical practice	Facilitation of health professional - patient interactions	10	
	Security, confidentiality and reliability	9	confidentiality- sound isolation at EyeMo is poor, violates confidentiality
Ease of use of the system		9	yes with the right staff, who can move the trailer and take care of the practical things, driving, parking, internet access
Effectiveness and cost-effectiveness		10	it saves travel costs- patient reimbursements for the county council

**Table 5.** Summary of comments, “the intervention”

The workforce - people and work patterns			
Impact on work and workflow	Not increasing staff workloads	9	
	Increasing efficiency of work patterns	10	
	Compatibility with divisions of labour	9	some changes, transporting the trailer
Education and training	Minimal training needed	10	not when it comes to clinical work, but a driver is needed
Relationships between different professional groups	Compatibility with existing power relationships	5	EyeMo will not have an impact on power relationships
	Enhancing confidence between groups	5	EyeMO will not impact confidence but might make different professional groups performance more visible if multiple groups are working at the trailer together
	Alignment of responsibility and accountability	5	that depends, if a consultation is needed then the nurse working at EyeMo is not responsible for the outcome. If no consultation is needed then the nurse is responsible for the outcome.

**Table 6.** Summary of comments, “the workforce”

### 3.2 Patients experiences of the mobile eye unit

During the second pilot period all of the patients who visited the mobile eye unit were asked to fill out a questionnaire. 80 questionnaires were handed out and 56 returned. The analysis done on the questionnaires shows the following.

### **3.2.1 Patient demographics and travel**

- 42-92 years old
- Average 67 years
- A total of 20 000 kilometres less travel for the 56 patients who filled in the questionnaire.
- 1 person used public transport in order to get to the mobile eye unit
- 37 people used taxi or private car in order to get to the mobile eye unit
- 17 people walked to the mobile eye unit

Due to very limited access to public transport in the sparsely populated rural areas of Västerbotten, most of the patients have to take a taxi or use their own car to get to the local health centre where the screenings are performed. Only one out of 56 patients was able to get to the health centre in Vilhelmina by using public transport. Due to the premedication given to the patients undergoing the screening none of the patients are allowed to drive, all of the patients need to have a person driving them to the examinations. 17 of the patients live very close to the health centre and were able to walk to the screening location.

### **3.2.2 Satisfaction and attitudes towards travelling**

- 98% of the patients were satisfied with the care they received at the mobile eye unit
- 98 % would recommend EyeMo to family members and friends.
- 9 out of 56 patients are not willing to travel to Lycksele hospital in order to get screened for diabetic retinopathy
- 9 out of 56 patients are not sure if they would be willing to travel to Lycksele hospital to get screened for diabetic retinopathy
- 38 out of 56 patients are willing to travel to Lycksele hospital in order to get screened for diabetic retinopathy.

The patients are very satisfied with the services provided at the mobile eye unit, and are willing to recommend the services to family and friends. The patients appreciate the close proximity to the screenings, 38 out of 56 patients are willing to travel an additional 240 kilometres to receive to take part in the screenings, the rest of the patients

have a more negative attitude towards travelling to the main hospital to get the necessary examinations. During the first pilot period in Storuman many of the elderly patients explained that they do understand the importance of the screenings but they would not be physically able to make the journey to the main hospital. Some of the younger patients experienced problems with taking the time off from work, having to travel to the main hospital to undergo the screening would require them to take a day off from work.

### **3.2.3 A summary of the comments written by the patients**

The patients were also asked to give feedback on the mobile eye unit. The patients appreciated the professional service. They experienced the screening process to be fast, effective and informative. The fact that they did not need to travel as long as they would have had to if the screenings were conducted at Lycksele hospital was highly valued by the patients. Below are some comments made by the patients;

*“Friendly staff, quick examination”*

*“Short travel time, nice staff. Was very fast, I’m pleased that I got the eye drops by post so that I could prepare for the visit at home.”*

*“They are always friendly and nice. I don’t have to waste the whole day on doing an examination that only takes 5-10 minutes. Close to my home!”*

*“It was an eye examination, I didn’t have to get involved at other things they do at health centres”*

*“Fast and good service”*

*“It was easier for me to take time off from work, and the staff were great.”*

*“The service is close to my home, I didn’t have to take the day off from work, I could go directly home from the trailer. “*

*“Positive atmosphere, nice nurses and I didn’t have to wait. Great!”*

*“Close and easy to find. Nice meeting without stress. Clean and nice looking trailer. “*

*“Getting a clear statement on the state of my vision was good, nice staff. Good information on what happens if anything changes regarding my vision. “*

*“I was well taken care of and staff was nice.”*

*“I don’t have to travel all the way to Lycksele hospital”*

*“Examination was very fast, I barely lost any time at work. I was back at work within the hour. “*

*“Great that the nurse came over here, I didn’t have to drive to Lycksele hospital”*

The analysis on the data gathered during the pilot demonstrates that the patients are very satisfied with the service, and are also satisfied with the quality of care they received at the mobile eye unit. When asked about negative experiences the patients only raised two points

- Accessing the trailer can be difficult for the elderly
- When sitting at the waiting room you can hear what is said in the exam room.

#### 4. Target group

There are over 11 000 people living in the County Council of Västerbotten who suffer from diabetes. Approximately 80% have type 2 Diabetes Mellitus and the remaining 20% suffer from Diabetes Mellitus type 1. On a national level the prevalence of diabetes is estimated to be 4.5%. According to the national guidelines patients with type 1 diabetes need to be screened once a year and patients with type 2 diabetes are screened at least every three years.

Commune	Population	Population with diabetes
Bjurholm	2490	113
Dorotea	2900	131
Lycksele	12475	562
Malå	3290	148
Nordmaling	7156	322
Norsjö	4361	196
Robertsfors	6859	309
Skellefteå	71879	3235
Sorsele	2743	124
Storuman	6227	280
Umeå	113734	5118
Vilhelmina	7156	322
Vindeln	5559	250

Vännäs	8405	378
Åsele	3133	141
Tot.	258367	11629

**Table 7.** Diabetics per commune in the County Council of Västerbotten

Commune	DM type 1	DM type 2	DM type 2 per year	Total nr of patients per year
Bjurholm	23	90	30	53
Dorotea	26	105	35	61
Lycksele	113	449	150	263
Malå	30	118	39	69
Nordmaling	64	258	86	150
Norsjö	39	157	52	91
Robertsfors	62	247	82	144
Skellefteå	647	2588	863	1510
Sorsele	25	99	33	58
Storuman	56	224	75	131
Umeå	1024	4094	1365	2389
Vilhelmina	64	258	86	150
Vindeln	50	200	67	117
Vännäs	76	302	101	178
Åsele	28	113	38	66
Tot	2327	9302	3102	5429

**Table 8.** Number of patients per town within the County Council of Västerbotten. Total number of patients in need of screening per year.

Table 8 presents the total number of patients suffering from diabetes type 1 and type 2. It also presents the amount of potential patients per year taking the national screening guidelines into consideration. Since the communes of Umeå, Skellefteå and Lycksele have functioning ophthalmology units have these communes been excluded from the next table and only the patients that could be examined at the mobile eye unit are presented.

Commune	Number of patients per commune
	Based on the national screening guidelines
Bjurholm	53
Dorotea	61
Malå	69
Nordmaling	150
Norsjö	91
Robertsfors	144
Sorsele	58
Storuman	131
Vilhelmina	150
Vindeln	117
Vännäs	178
Åsele	66
Total number of patients	1268

**Table 9.** Total number of screenings per year, type 1 and type 2 Diabetes. Each commune within the County Council of Västerbotten is presented separately.

The yearly number of patients that could be screened at the mobile eye unit is approximately 1268 in the County Council of Västerbotten. Table 10 presents the average travel distances for patients living in the communes of Västerbotten to the nearest hospital (Umeå, Skellefteå or Lycksele hospital).

Commune	Nr patients per year	of per	Closest hospital	Distance commune-hospital km	Return km	Total travel per commune km
Bjurholm	53		Umeå	60	120	7200
Dorotea	61		Lycksele	140	280	17080
Lycksele	263		Lycksele	0	0	0
Malå	69		Lycksele	85	170	11730
Nordmaling	150		Umeå	55	110	16500
Norsjö	91		Skellefteå	90	180	16380
Robertsfors	144		Umeå	60	120	17280
Skellefteå	1510		Skellefteå	0	0	0
Sorsele	58		Lycksele	145	290	16820
Storuman	131		Lycksele	105	210	27510
Umeå	2389		Umeå	0	0	0
Vilhelmina	150		Lycksele	120	240	36000
Vindeln	117		Umeå	55	110	12870
Vännäs	178		Umeå	30	60	10680
Åsele	66		Lycksele	90	180	11880
Tot	5430					201 930

**Table 10.** The average distance between communes and closest hospital.

If patients can be screened for diabetic retinopathy within their own commune the estimated savings in travel are in total over 200 000 kilometres per year. Since the

public transport system in the sparsely populated rural areas is extremely limited most of the patients are forced to use a taxi or private car to get to the hospital.

## **5. Outcomes**

### **5.1 Medical outcomes**

Since the same equipment is used at the mobile eye unit as at the County Councils ophthalmology units, and the same staff members are performing the examinations the implementation of EyeMo does not affect the medical outcomes. Piloting EyeMo would however increase access to diabetic screenings in the rural areas of the County Council of Västerbotten leading to improved care of patients with Diabetes type 1 and type 2.

### **5.2 Benefits of using the service**

Implementing the mobile eye unit will increase access to specialist health care in the sparsely populated areas of Västerbotten. The main beneficiaries of implementing the mobile eye unit are the patients. Bringing the screening service closer to patients home allows patients without the possibility to travel to the main hospital, to receive the examination, and gain access to services provided by the ophthalmology unit. By bringing the screening service closer to patients costs are saved in reimbursing the patients travel costs and it will also have a positive impact on the environment with decreasing CO2 levels. It is also notable that the amount of cancelled appointments decreases when screenings are performed locally.

It is estimated that up to 80% of people who have diabetes for ten or more years will suffer from some degree of retinopathy. Approximately 90% of new cases could be reduced by regular screenings and monitoring, and up to date treatment plans. In the long run patients who do not have the possibility to participate in regular screenings will require a more aggressive and expensive form of treatment if the condition worsens and is not monitored regularly.

## **6. Lessons learned**

Interviews, e-HIT and a SWOT analysis on EyeMo were done by the Finnish project partners and the results disseminated to the project partners. The reports provided on EyeMo have been helpful when preparing for implementation of EyeMo in Sweden. Having access to the results has highlighted some areas of implementation that should be carefully considered when the service is implemented in Sweden. Learning from the experiences gained when EyeMo was implemented in Finland has given valuable information and has been helpful in predicting and counteracting possible problems. The results of data collection in Finland functioned as a base for decision making in Sweden. In order to successfully implement a service across borders it is vital to collect

as much information as possible on how the service is operated and organised at its origin.

It is equally important to monitor the pilot closely, frequent contact with the staff performing the clinical work is essential in order to spot and counteract potential problems well in advance.

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