Rural-Urban Differences in the Pattern of Referrals to an Asynchronous Teledermatology Service

Abstract

Background: Telemedicine is particularly useful in rural areas where can facilitate access to specialised care in regions far from urban hospitals and can prevent unnecessary travel. The purpose of this research was to evaluate the degree of resolution of an asynchronous teledermatology service in the Bages County, comparing urban and rural primary care centres.

Methods and findings: A longitudinal descriptive study of referrals from 14 Primary Care Teams to a hospital dermatology service as a result of a previous referral to a teledermatology program was performed, comparing years 2015 and 2016 and urban with rural practices.

Both in urban and rural areas there was an increase in referrals to the teledermatology service in 2016 compared to the previous year (12.9% and 0.3% respectively). In the two years analysed, referral rates to the teledermatology service per thousand inhabitants from rural centres was statistically much higher than that of urban centres (p<0.001). The number of referrals to the face-to-face dermatology service after a teledermatology consultation decreased significantly in both urban [OR=0.81 (0.70-0.93) p=0.001] and rural centres [OR=0.64 (0.57-0.72) p<0.001].

Conclusions: The asynchronous teledermatology service established in the Bages County increases the resolution of primary care teams as reduces referrals to the face-to-face dermatology service. This effect is more pronounced in rural than in urban areas. Such finding may indicate the need to prioritize telemedicine services in rural primary care practices.

Keywords
Dermatology; Ehealth; Primary Care; Telehealth; Teledermatology; Telemedicine
Introduction

Telemedicine has been defined as the "medicine practiced at a distance" [1]. According to the timing of the information transmitted, three main types of telemedicine can be distinguished: store-and-forward or asynchronous (not real-time) telemedicine, videoconference or synchronous (real-time) telemedicine and remote patient monitoring [2,3].

Telemedicine has shown in several studies its effectiveness, efficiency, safety and capacity to reduce costs [4-6]. These effects are especially important in rural areas where telemedicine can enhance access to health for patients living in rural or remote areas [7-9]. Telemedicine benefit patients as they improve access, but also professionals, as they increase contact with specialists and allow them to have better access to professional development [10]. Primary care physicians have reported the educational benefits of telemedicine [3].

Telemedicine services are well accepted by users [11,12]; satisfaction has been reported to be higher in rural settings than in urban settings, since it can prevent unnecessary travel to hospitals [13]. By facilitating access to specialised care in regions far from urban hospitals, telemedicine can help reducing inequalities between rural and urban areas [8,14].

In three counties of Central Catalonia; Anoia, Bages and Berguedà, asynchronous telemedicine services between primary care and local hospitals have been developed. Among the programs of telemedicine, the most successful has been teledermatology and the most innovative teleulcers and teleaudiometries. In the teledermatology program set in Bages, in operation since 2010, primary care professionals take photographs of dermatological lesions and attach them into the patient’s computerised medical records together with a clinical description. The use of electronic medical records guarantees the confidentiality of the images at all times, since it is not necessary to send them by e-mail or store them in an external server. The dermatologists at the hospital access the patient’s medical history, review the images and propose a treatment or plan of action to follow. The primary care professionals review the proposal and make a phone call to the patient to explain the results of the consultation. The whole process usually takes less than a week. If the dermatologists consider it convenient, can ask the primary care professionals to refer the patient for a face-to-face visit.

This program has had considerable success in reducing the dermatology waiting lists, achieving an average reduction in patient wait time from 30 to 16 days [15]. The objective of this study is to evaluate the degree of resolution (as the capacity to solve health problems within primary care) of the Bages asynchronous teledermatology service and analyse whether there are differences between rural and urban primary care teams.

Methods

We conducted a longitudinal descriptive study of the referrals to the hospital dermatology service as a consequence of a previous referral to the teledermatology program in the Bages region during the years 2015 and 2016.

As population of reference we took the entire population included in the 14 Primary Care Teams (PCTs) of the County of Bages that used the teledermatology service at some point. The PCTs of Bages have to two different health care providers: Institut Català de la Salut (12) and Althaia, Xarxa Assistencial Universitària (2). These teams refer patients to a district hospital located in Manresa (Sant Joan de Déu Hospital). The PCTs include Primary Care Centres and Surgeries located in populations of less than 12,000 inhabitants, except Manresa, which is a city of almost 75,000 inhabitants [16].

Although there is no consensus about when a population is considered rural or urban, for this study we have used the analysis done by Dominguez Amorós et al. that classified all Catalan populations in rural and urban according to the number of in-
habitants, density of population and sectors of economic activity. Considering this study, except Manresa (with four PCTs) and Sant Joan de Vilatorrada, which are considered urban areas, the rest of the Bages population is considered rural [17]. For each of the PCTs, we extracted from computerized medical records data relating to the population assigned to the centres together with the origin and the total of the consultations to the teledermatology service and the referrals made to the conventional dermatology service.

For the analysis, the chi-squared test was used to compare the percentage of referrals to the traditional dermatology service after an initial consultation with the teledermatology service. We considered a dermatology referral resulting from an initial teledermatology consultation any dermatology visits produced in the three subsequent months. The analysis was made comparing years 2015 and 2016 and urban areas with rural areas. The results were considered significant with $p<0.05$. The statistical program SPSS v8 was used for the statistical analyses.

**Results**

We found that during 2015, a total of 2,124 referrals were made to the teledermatology service from the 5 PCTs located in urban centres, originating a total of 531 visits to the dermatology service (25%). This represents a referral rate of 22.3 per 1,000 inhabitants. During 2016, a total of 2,398 referrals were made to the teledermatology service from urban centres, originating 508 subsequent face-to-face visits to the dermatology service (21.18%). This represents a referral rate of 25.2 per 1,000 inhabitants.

Between 2015 and 2016, teledermatology consultations increased by 12.9%. In contrast, the number of referrals to dermatology as a consequence of an initial referral to teledermatology decreased significantly from 531 to 508 visits OR=0.81 (0.70-0.93) $p=0.001$. *(Table 1)*

During 2015, a total of 3,198 referrals were made to the teledermatology service from the 9 PCTs located in rural areas. Of these referrals, 844 required a face-to-face visit to the dermatology service (26.39%) The referral rate of these centres was 32.4 per 1,000 inhabitants. During 2016, a total of 3,208 referrals were made to the teledermatology service from PCTs located in rural areas. Of these referrals, 596 were subsequently seen in the conventional dermatology clinics (18.58%). This represents a referral rate of 33.5 per 1,000 inhabitants.

Between 2015 and 2016, the number of visits to teledermatology increased slightly by 0.3%. The number of referrals to dermatology as a consequence of the initial referral to teledermatology decreased significantly from 844 to 596 visits OR=0.64 (0.57-0.72) $p<0.001$.

Overall, in the two years analysed, referral rates to the teledermatology service per thousand inhabitants from rural centres was statistically much higher than that of urban centres ($p<0.001$). *(Table 2)*

**Table 1. Referrals to the teledermatology service from urban centres.**

<table>
<thead>
<tr>
<th>Year</th>
<th>Assigned population</th>
<th>Teledermatology referrals</th>
<th>Referral rates per 1,000 inhabitants.</th>
<th>Dermatology referrals</th>
<th>% referral</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>95,102</td>
<td>2,124</td>
<td>22.3</td>
<td>531</td>
<td>25%</td>
</tr>
<tr>
<td>2016</td>
<td>95,102</td>
<td>2,398</td>
<td>25.2</td>
<td>508</td>
<td>21.18%</td>
</tr>
</tbody>
</table>

**Table 2. Referrals to the teledermatology service from rural centres**

<table>
<thead>
<tr>
<th>Year</th>
<th>Assigned population</th>
<th>Teledermatology referrals</th>
<th>Referral rates per 1,000 inhabitants.</th>
<th>Dermatology referrals</th>
<th>% referral</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>98,795</td>
<td>3,198</td>
<td>32.4</td>
<td>844</td>
<td>26.39</td>
</tr>
<tr>
<td>2016</td>
<td>98,795</td>
<td>3,208</td>
<td>33.5</td>
<td>596</td>
<td>18.58</td>
</tr>
</tbody>
</table>
Both in the urban environment and in rural areas there is an increase in referrals to the teledermatology service in 2016 compared to the previous year. This increase could be due to a greater familiarisation with the service by professionals and users. However, the number of referrals to the face-to-face dermatology service after a teledermatology consultation also decreased significantly and this effect was more pronounced in rural centres. This may indicate an educational effect of the teledermatology program for primary care professionals, as some studies have previously suggested [18, 19].

The teledermatology consultation rate per thousand inhabitants assigned was greater in rural teams than in the urban ones. This could be explained by the fact that in rural areas, where predominate an increasingly aging population and hospital are often far away, professionals and patients try to avoid hospital visits through the use of telemedicine. It is in rural areas where telemedicine can have a more beneficial effect from a social point of view, avoiding unnecessary and often long trips to the hospitals [10].

Discussion
These results have important implications for rural family practice as have shown that the impact of telemedicine programs is greater in these practices and open a debate about the need to prioritize telemedicine in rural areas. However, telemedicine should not represent a negative impact on access to usual health services by rural communities and should not be used as an excuse to reduce health services in these areas.

This study presents some limitations, the main one of which is given by the definition of the concept of rurality, not commonly agreed.

Conclusions
We can conclude that the asynchronous teledermatology service in operation in the Bages County increases the resolution of primary care teams as reduces referrals to the face-to-face dermatology service. This effect is more pronounced in rural than in urban primary care practices.

Acknowledgements:
To the Technical and Support Area of Gerència Territorial de la Catalunya Central for its implication in the data collection.

Funding
No funding was received.

Conflict of interest
None.

References


