5 YEARS OF EARLY MANAGEMENT OF SKIN CANCER BY TELE-DERMATOLOGY: WHAT HAVE WE LEARNED FROM REAL-WORLD DATA?

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ABSTRACT

This paper presents a tele-expertise experiment in dermatology with the aim of early detection of skin cancers. This telemedicine system allows the general practitioner (GP) to send a request for an opinion to a distant dermatologist. Carried out in France (Hauts-De-France region) for 5 years, this experiment gathered real data exchanged between GPs and dermatologists, and accounting for a total of 1,812 tele-expertises. The results show that tele-expertise makes it possible to reduce the time taken to take charge of dermatology patients. It is also noted that the requests of GPs do not relate only to skin cancer, yet also to benign lesion. Based on a numerical model developed alongside with the experiment, the next challenge is to demonstrate the economic sustainability of tele-expertise in dermatology.

KEYWORDS

Tele-Dermatology, Skin Cancer, Expertise, Time Access, Real-World Data, Medico-Economic Sustainability

1. INTRODUCTION

Dermatology is a medical specialty that early recognized the usefulness of relying on new technologies to improve practice and, in some areas, to counterbalance declining medical demographics. Numerous studies have shown that tele-dermatology is a reliable and acceptable practice (Bashshur, 2015; Trettel, 2018). One of the first objectives of tele-dermatology was to validate the images captured by communication tools and verify that image quality was sufficient and identical to that of physical examination (Coates, 2011; Chen, 2014). Telemedicine has proven to be a good communication tool between general practitioners (GP) and dermatologists (Van den Akker, 2001) as well as a vehicle for improving the skills of treating physicians (Pala, 2020).

Tele-dermatology has also shown strong utility in oncology for the detection of skin cancers via tele-expertise which allows the specialist remotely to make a diagnosis and organize treatment (Fabbrocini, 2011; Finnane, 2017), and to identify melanomas based on remote pictures (Chuchu, 2018). In fact, the detection of a skin cancer can come from the patient who himself notices a suspicious skin lesion or from the GP during a consultation for another reason, or during hospitalization. In addition, tele-expertise helps limit patient’s travel burden from a medical practitioner to the next.

Tele-expertise offers three models of practice for the management of skin tumors:
- Advisory opinion and improving diagnosis accuracy;
- Triage of patients with benign vs. malignant lesions. Patients with skin cancer are given priority treatment;
- The appropriate medical direction and clinical follow-up, by validating the need to consult a specialist or not, or to be treated, biopsy or surgery.
In the case of skin cancer, the major issue is to establish diagnosis as early as possible, so as to prevent the further spread of malignant cells to other organs. But even if patients report changes in the pigmentation of their lesions, this may still lead to delayed care. Tele-expertise responds to a problem of medical demography. It facilitates access to expertise healthcare for various categories of the population, especially those located far from city centers where the medical demography is greater (Coutasses 2018). The shortage of medical doctors is indeed leading to creating long waiting time for first appointments. Tele-dermatology reduces waiting time and allows early assessment of the lesion and its treatment (Finnane, 2017).

The objective of this paper is to present an experiment carried out in France (Hauts-de-France region) for 5 years and to analyze the quantitative data obtained by the technological platform collecting and relaying tele-expertise in dermatology. The results in terms of time to treatment, addressed skin lesions, and patients’ medical trajectory will be analyzed. The issue of remuneration for the medical act of providing tele-expertise will also be discussed, as a key factor in assessing medico-economical sustainability of this initiative.

2. METHODS

This is a retrospective, observational study based on data from real practice (RWD, Real World Data), i.e. data generated during routine clinical practice (Makady, 2017). The data come from a French experiment carried out from November 2015 to December 2020 in the Hauts-de-France region.

2.1 The French Experiment

Declining medical demographics of dermatologists is a reality in the Hauts-de-France region, with a 9.5% decrease over the 2007-2016 period and a density of 3.6 dermatologists per 100,000 inhabitants, vs. 5.1% in France (CNOM, 2016). Based on this observation and in order to promote faster treatment of patients with a suspicious skin lesion identified by their GP during a consultation, an organization making it possible to make the best use of the medical resources available in the region, has been developed.

This experiment began in November 2015 in the departments of Aisne, Oise and Somme, then extended in 2018 to the Hauts-de-France territory and is still in the experimentation phase. Using a dermatology tele-expertise software (online application), GPs can seek advice and/or action from a dermatologist.

Before being able to request an opinion on the dermatology tele-expertise application, GP must undergo training (first-hand, which has evolved into e-learning via a training platform, then into a webinar). The training aims at presenting the implementation of tele-expertise in dermatology, the use of the dedicated application, medical responsibility issues, and above all to deepen GPs clinical understanding of skin cancer screening, which actually was a strong request from these practitioners.

When a skin cancer is suspected, the procedure involves a sequence of activities. First, when the GP receives a patient with a suspicious dermatological lesion (identified by the doctor or by the patient himself), he offers the patient a tele-expertise, to which the patient may or may not consent.

Using a dermatology tele-expertise application available on a mobile phone, the GP completes a form containing patient information, takes photos and sends them to the dermatologist. The dermatologist has 7 days to respond, either by connecting to the platform available on a computer or to the application available on a mobile phone.

As soon as the expert opinion is generated by the dermatologist, the GP receives a notification on his application and can contact his patient to inform him of the expertise and the follow-up to be given (monitoring, appointment, etc.).

2.2 Available Data

The data available originate from two tele-expertise software platforms (Inovelan from 2015 to 2018 and Maincare from 2018 to 2020) used in the project. A total of 1,812 tele-expertise initiated by their GP with a remote expert opinion were implemented. The available data relate to the demographic and clinical profile of the patient, the dates of request for an opinion and the dates of expert return, the motive for the request, the type of skin lesion or tumor, the diagnosis proposed by the expert, the conduct to be taken following the diagnosis (e.g.: no treatment; meeting with dermatologist; clinical follow-up or surveillance by GP etc.). Also available are data of an online chat function allowing GPs and dermatologists to exchange more qualitative information.
3. RESULTS

3.1 Details on the Use of Tele-Expertise

1,812 tele-expertise requests were made between November 2015 and December 2020 by GP. Regarding gender of included patients, requests were made for 47% of men and 53% of women. The average age was 55.5 years old, the youngest was a baby and the oldest 99 years old. Patients with a history of skin cancer represented 14.5%.

There was a positive evolution in the number of tele-expertise from 2016 ($n=289$) to 2020 ($n=713$). The number of doctors involved had evolved positively over the period. The number of GP increased from 36 in 2016 to 126 in 2020 and the number of dermatologists from 16 in 2016 to 25 in 2020. GPs have shown themselves to be more and more interested in tele-expertise. The number of dermatologists is limited in the Hauts-de-France region and due to the retirement of some of them, the number is decreasing a little over the project’s time period.

3.2 A Request for Tele-Expertise not Limited to the Most Serious Cases

The objective of the tele-expertise was to enable a GP to contact a dermatologist for a suspected skin cancer. However, GPs requested a tele-expertise because they thought they were dealing with a skin cancer in only 6.6% of cases, a benign tumor in 13.47% of cases and expressed doubts in 66.50%. In the end, the dermatologists’ responses did diagnose a malignant tumor in 14.84% of cases, a benign tumor in 42.39% of cases and they shared uncertainty in diagnosis based only on the medical file and photos for 35.9% of cases.

This is confirmed by the type of lesions detected by the dermatologist. The frequency of distribution of lesions with a malignant, benign or undefined character is presented in table 1. Only 28.44% of lesions are classified as skin cancers, while 5.9% are pre-cancerous lesions.

<table>
<thead>
<tr>
<th>Cancerous lesions</th>
<th>Pre-cancerous lesions</th>
<th>Benign lesions</th>
<th>Not determined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basal cell carcinoma (10.13%)</td>
<td>Actinic keratosis (5.9%)</td>
<td>Naevus (21%)</td>
<td>Unspecified</td>
</tr>
<tr>
<td>Squamous cell carcinoma (3.97%)</td>
<td></td>
<td>Seborrheic keratosis (18.95%)</td>
<td>(17.38%)</td>
</tr>
<tr>
<td>Bowen's disease (1.74%)</td>
<td></td>
<td>Angiome (1.49%)</td>
<td>Others (1.67%)</td>
</tr>
<tr>
<td>Dubreuilh melanom (0.49%)</td>
<td></td>
<td>Histiocytobrome (1.42%)</td>
<td></td>
</tr>
<tr>
<td>Keratoacanthoma (0.8%)</td>
<td></td>
<td>Wart (0.93%)</td>
<td></td>
</tr>
<tr>
<td>Unspecified skin cancer (11.31%)</td>
<td></td>
<td>Cyst (0.93%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fibroma (0.87%)</td>
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<td>Papillom (0.68%)</td>
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<td>Lentigo (0.31%)</td>
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The question then arises as to whether the use of tele-expertise may have been diverted from its initial objective and allows the GP easier access to the dermatologist for less urgent cases.

Tele-expertise improves medical regulation of patients depending on emergency level. In parallel with this analysis of system use in real-life, a qualitative study was carried out by social science researchers from EHESP School of Public Health. They demonstrated, based on a survey of GPs involved in the experiment, that “tele-expertise is a well-accepted technological innovation in dermatology among GP, which enables the best use of the scarce medical resources [in dermatology] available in the region and to address the needs of patients” (Marrauld, 2021). Moreover, the tele-expertise platform could reduce the time taken to access the dermatologist (Marrauld, 2021). This is one of the important consequences of tele-expertise development, which issue is addressed below.
3.3 Impact on patient care access time

Different access times are identified:

- The access times to the first dermatology consultation, that is, the waiting time for initial treatment;
- The average response time and diagnosis by the specialist which depends on whether the lesion is malignant or benign, the median waiting time for patients with melanoma was 14 days and 13.5 days for squamous cell carcinoma in the British study by May (2008);
- The time for implementing the action to be taken: biopsy, surgical intervention (excision). Excision make it possible to confirm the malignant character of a lesion. The tele-dermatology approach facilitates its access: the average time of biopsy of cancerous lesions was measured at 13.8 days for the traditional practice vs. 9.7 days for tele-dermatology (Kahn, 2013).

In the case of our study, we calculated the time between the date of request for a dermatologist’s opinion by the GP, and the date of expertise transmitted by the dermatologist to the data exchange platform.

The average time between the tele-expertise request and the expert's return is 5.094 days on average (SD = 14.54). The median is 0.797. To compare this figure with the traditional time taken to take care of a dermatology patient in the region, we interviewed 13 general practitioners. They estimate at 171 days (5.7 months) the time to obtain an appointment with the dermatologist, despite the support in a coordinated care course started by the GP. The differential is 166 days and it is statistically significant.

Figure 1 shows the time between the result of the tele-expertise, and a new consultation with the dermatologist.

Figure 1. Delays between the result of the tele-expertise and a new consultation with the dermatologist

The dermatologist takes over the tele-expertise in less than a month when a skin cancer has been detected. Consultation times are longer for benign tumors because dermatologists will wait to follow the evolution of the lesion at 3 or 6 months in order to make the best medical decision. And when the diagnostic could not be clearly established by tele-expertise, the deadlines are also shortened. The use of a dermatoscope makes it possible to have a diagnosis with greater certainty, in particular for malignant lesions and then treat the patient as quickly as possible.

We can still conclude that tele-expertise makes it possible to reduce the time taken to obtain an appointment with the specialist medical doctor. This has been confirmed in other studies, without yet having a consensus on the duration gained. Börve (2013) shows a decrease in the time taken to obtain an appointment from 80 days to 2 days. He also noted a drop in the time taken for surgery (from 85 days to 36 days). In New Zealand, the average tele-dermatologist response time was 2.07 hours (McGoey, 2015). In the study by Coloma (2019)
in Chile, the average time to be diagnosed with tele-dermatology was 12.6 days. This time was reduced by 6.4 days after the involvement of a new dermatologist in the team, which also shows that tele-dermatology certainly makes it possible to compensate for medical demographic problems, provided they are in sufficient number to provide a remote response. The differences in terms of number of days of patient care depends on the organization of the health system, medical demography and for tele-dermatology the size of the network of doctors involved, the number of requests, the ergonomics of the technological platform.

3.4 Impact on the Patient’s Care Path

Tele-expertise, as it is organized in Hauts-de-France, does not change the course of the patient’s care path, nor does it affect the role of the GP in the healthcare process or value chain. Only the access to the specialist is facilitated, in particular with access times being reduced. Following the tele-expertise, the dermatologists indicate whether a treatment is needed. The recommended course of action after the tele-expertise was as follows (Figure 2).

Figure 2. Actions to be taken recommended by the dermatologist following the tele-expertise

In 55.95% of cases, tele-expertise revealed a need for follow-up by the dermatologist. The GP is able to resume monitoring the patient for 11.90% of cases. But, in 16% of cases, the lesions observed did not require treatment and allows another patient to be cared for.

Even though there were only 25% of skin cancer detected, more than half of the cases required a visit to the dermatologist. Tele-expertise thus allows better care, even for mild cases.

This type of representation in the form of a decision tree will allow us to identify the savings achievable thanks to tele-expertise. Indeed, one of the current challenges is to determine the best business model for tele-expertise.


At the economic level, Snoswell’s systematic literature review (2016) shows that tele-dermatology is cost-effective, and the savings are greater, the more distant from the dermatologist’s office patients are. This means less travel for patients (Ferrandiz, 2017), as well as an increase in their productivity because they lose fewer days of work. Patients also get treatments more quickly and some useless treatments are even avoided, such as for instance biopsies that are not required if the tumor is not benign.

From the dermatologist’s point of view, tele-expertise helps save time because these medical specialists can treat each case more quickly (Whited, 2015; Ferrandiz, 2017), and because fewer cases are presented to them (due to the upstream triage of patients). In 2015, in their literature review, Gordon et al. confirm that
economic analyzes of the early detection of skin cancer are still necessary and must be carried out (Gordon, 2015).

However, tele-dermatology implies that the GP completes the electronic files on the platform used, for some this can represent a double entry and a waste of time or they do not do it and the data is lacking. Therefore, the most impacting sustainability issue here is the lack of remuneration for this act in a number of countries, as well as the absence of an associated business model, that makes it worthwhile for the dermatologist to join.

Within the framework of the French experiment, avoided savings were observed in terms of kilometers avoided for patients, and less specialist consultations and examinations. These savings made, as well as the costs incurred (technology, coordination…), have yet to be measured. Two medico-economic research protocols are in progress.

The medico-economic results will also make it possible to adjust the level of remuneration for tele-dermatology acts for applicants and those required. In France, tele-expertise acts have been reimbursed by common law since February 2019. It is the first country to reimburse the tele-expertise act at a national level and for any doctor, whatever his specialty (Ohannessian, 2020). The question arises as to whether the amount invoiced is sufficient (from 12 to 20 € for the required doctor – medical expert – and from 5 to 10 € for the requesting – the GP). Compensation was then reviewed during the summer of 2021 (20 euros for the required doctor and 10 euros for the requesting doctor).

When this project was set up, a remuneration model was negotiated, namely 14 euros for a request for an opinion by a GP in addition to the classic consultation and 46 euros for the dermatologist during the diagnosis and / or the conduct to be taken issued. The remuneration was negotiated because the model based on article 36 of the law n°2013-1203 on the financing of Social Security for 2014 provided for the dermatologist 27 euros while the remuneration of the general practitioner was not determined. Note that the compensation model proposed in the context of the experiment, with regard to amendment 6 to the medical agreement, is superior to conventional negotiations.

The qualitative analysis carried out (Marraud, 2021) showed that general practitioners were satisfied with the remuneration offered by the experiment, but this is not a priority. Their priority was really to be able to quickly access the dermatologist. On the other hand, for the dermatologist, carrying out an expertise takes time and they consider it necessary to be able to be remunerated at their fair value. They believe that the € 20 bill is insufficient, but that they are satisfied with the proposal made by the Hauts-De-France region. To maintain this level of remuneration, it is necessary to provide proof that the use of tele-expertise allows savings to the health system, which is why an economic evaluation will be carried out.

5. CONCLUSION

After 5 years of using tele-expertise in Hauts-De-France region, doctors and patients have shown an interest in treating suspicious skin lesions with the expert support from a remote dermatologist. Several advantages were highlighted: a feedback from dermatologists in reduced time, a slightly modified and more adapted treatment path, management of all types of lesions. Once these real word data have been submitted to an economic evaluation protocol, it could be justified to perpetuate this type of application of telemedicine, and to develop it further.

The major take-aways about these 5 years analysis are then:
- Tele-dermatology is a triage tool for the dermatologist, improving the chances of survival for patients and optimizing the consultation;
- for the GP, this allows easier access to the dermatologist and to benefit from companionship with the dermatologist, this would allow the GP to improve their skills;
- for the patient, this puts back into the care pathway people who have given up;
- finally, it is a real decision-making tool to monetize the financing of telemedicine.

The perspectives of this work are therefore to compare the real data on the use of tele-expertise with the real data on the consumption of care provided by patients, and to compare them to patients with traditional care. In addition, interviews with patients are planned to find out their perception of tele-expertise and their satisfaction with this new type of care.
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