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How to produce a diagnostic opinion at a distance? New forms of tele-expertise use in France and their transformational effects on healthcare practices in dermatology

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How to produce a diagnostic opinion at a distance, without seeing and examining patients? This is the challenge of tele-expertise (TLX), defined first in legal terms, as one of the five telemedicine acts in France. It consists of a particular form of healthcare practice in which a physician, known as the "requester", solicits remotely the opinion of another practitioner, a specialist known as the "requested", by sharing with him/her clinical information and photographs that he/she produces for this purpose, based on the medical examination of the patient. This practice is certainly not new; it is inherent to any medical activity where it develops outside of any legislative and regulatory framework, between practitioners who already know each other more or less well. So the novelty of the recent forms of TLX as a legally recognized medical act in its own right, relies mainly on the development of secure file exchange platforms within territorialized care networks, the systematization of these practices beyond the networks of acquaintances and their coverage by the health insurance. The purpose of this article is to describe the various usages of this new form of TLX, as well as to understand how they contribute to the in-depth transformation of care practices and organizations. It suggests doing so in the specific case of dermatology, through a qualitative study based on semi-directive interviews approximately with fifty French dermatologists, mainly requested experts, practicing TLX both in the context of private practice and in a hospital setting. The results of this empirical study are presented in three parts. First, we will consider the specificity of dermatological practice and describe the particular ways in which TLX is being implemented in this field, as a new framework. Then, we will report on the multiples efforts and skills needed to produce a diagnostic opinion remotely. We will lastly present various uses that dermatologists develop of TLX in different socio-organizational configurations. We will finally discuss how these uses transform the usual practices of dermatologists, not only by creating a new type of activity, but also by allowing them to participate differently in the organization of care pathways.

KEYWORDS

telemedicine, tele-expertise, Store-and-Forward, teledermatology, health communication, diagnostic opinion, coordination of care, invisible work

1. Introduction

How to produce a diagnostic opinion at a distance, without seeing and examining patients? This is the challenge of tele-expertise (or Store-and-Forward), one of the most developed telemedicine practices in the medical world, between remote practitioners. In France, tele-expertise (TLX) is first defined in legal terms, by legislation published in the 2010s on the regulation and reimbursement of telemedicine acts.[1] These texts describe this practice as a particular form of healthcare in which a general practitioner or a specialist, known as the *requester*, remotely seeks the opinion of another one, known as the *requested*, by transmitting clinical information and iconographic elements that he/she produces for this purpose, based on the patients' clinical examination. This practice is certainly not new: it is inherent in any medical activity, where it develops outside any legal and regulatory framework, informally, between practitioners who know each other beforehand. This is especially true in specialties such as dermatology, where vision is central to the diagnostic process. The novelty of the most recent forms of TLX, which is legally "framed" and recognized as a medical act in its own right, lies in the development of secure file exchange platforms, the systematization of these practices beyond the networks of acquaintances, and their reimbursement by the National Health Insurance. In this context, TLX is presented as a new framework that uses digital technologies to reorganize existing communication activities between health professionals, in order to improve access to care in areas known as "medical deserts".

1.1. Framed forms of TLX practices: a blind spot in social science literature on telemedicine

Today, TLX is increasingly being developed in a framed form, i.e., whose rules are defined as the result of a collective negotiation process between healthcare actors, political institutions and technology providers. That said, we are still largely in the dark as to how these framed practices—are developing in the field, as a new way of consulting medical expertise and producing a diagnostic opinion at a distance. In fact, a large body of scientific literature focus on the evaluation of this practice, particularly in Western countries where the first large-scale experiments were carried out. In the field of dermatology, an impressive number of literature reviews attempt to extract from hundreds of case studies, more general lessons on the conditions of success of this practice (Eedy and Wootton, 2001; Bashshur et al., 2015; Finnane et al., 2017; Lee and English, 2018; Liddy et al., 2019; McKoy et al., 2021). However, the majority of these studies focus on the development of TLX mainly from a clinical effectiveness perspective, by examining the concordance rates between diagnoses made with TLX and those made during traditional face-to-face consultations. Many other studies are being carried out to evaluate TLX from an economic efficiency perspective, by assessing the cost reduction resulting from TLX (Mort et al., 2007). These studies may play an important role in the adoption of these new systems by practitioners. Yet, they do not allow us to access the concrete reality of practices developed in a wide range of contexts. The majority of reviews conducted in the medical field, agree though on the observation of a significant heterogeneity in practices, which are ultimately difficult to compare (Finnane et al., 2017).

In social sciences, the development of telemedicine has also been the subject of an extensive international literature, inspired by *Science and Technology Studies*. This body of work focuses on the multiple reconfiguration phenomena at work in healthcare practices and relationships (Oudshoorn, 2008, 2011, 2012; Nicolini, 2010; Pols, 2012). However, most of this work has been conducted in experimental settings and focused on the case of teleconsultation (Mathieu-Fritz and Gaglio, 2018). Numerous research studies have focused on the ways in which clinical interactions are reconfigured by the new spatiality and temporality of remote care practices (Miller, 2001, 2003, 2011; Oudshoorn, 2012; Pappas et al., 2019; Grosjean et al., 2020). In our previous work, we have focused on how healthcare relations and practices are transformed in the context of teleconsultation (Esterle et al., 2011; Mathieu-Fritz and Esterle, 2013; Mathieu-Fritz, 2018, 2021). For instance, we have highlighted new forms of work delegation between practitioners, as well as phenomena of knowledge transfer and skill development (Mathieu-Fritz and Esterle, 2013). How do these recompositions operate in the case of TLX, where interactions are organized in a very different way than in teleconsultations? In TLX, the two practitioners do not interact in real time, but asynchronously, in a deferred mode. Furthermore, the patient is not present for the requested expert who has to make the diagnosis remotely, based on clinical information and photographic elements produced by the requesting physician during a face-to-face consultation with the patient.

The literature on teleconsultation focuses on the new spatial dynamics of remote interactions, studying in particular how different actors participate in the constitution of a "shared territory" (Grosjean et al., 2020), especially in order to "feel from a distance" (Nicolini, 2006; Oudshoorn, 2008, 2011, 2012; Gherardi, 2010; Pols, 2012; Mathieu-Fritz, 2018). This research perspective on the reconfiguration of communication activities can be extended in the case of TLX to study diagnostic reasoning and the broader socio-organizational processes by which it is carried out between two different interaction spaces, each with its own temporality. The first space is where the request for advice is formulated, through the interaction of a patient with "his/her" doctor. The second space is where the two practitioners, through platforms and digital tools, produce the diagnostic advice and eventually coordinate needed care afterwards. The study of the TLX therefore sheds new light on how the use of telemedicine is constructed concretely and jointly, in very heterogeneous contexts of activity.

1 In France, telemedicine was first authorized by the "Hospital, Patients, Health, Territories" law in 2009. In 2010, the Public Health Code defines the main telemedicine activities such as teleconsultation, telemonitoring, tele-assistance and tele-expertise. After an experimental phase, the economic models for TLX were implemented in February 2019. This was a year before the COVID-19 epidemic that led the government to expand the definition of reimbursed procedures (Ohannessian et al., 2020). In 2021, a new decree issued due to open TLX to other healthcare professionals such as medical assistants and pharmacists. Today, TLX performed between two medical professionals is fully covered by the National Health Insurance.

How do the requested experts manage to formulate a remote diagnostic opinion, without seeing or examining the patient, on the basis of information collected and transmitted by unknown practitioners, whose specialities and degrees of specialization, as well as equipment, vary greatly depending on the context? What are the efforts to be made, the activities to be performed, as well as the knowledge and skills that practitioners must acquire in order to integrate and operate these TLX systems in their daily practice? What are the new forms of TLX use and how do they transform established care practices, relationships and organizations? This article addresses these questions in the field of dermatology, one of the specialties where telemedicine practices were implemented well before the new regulatory framework (Perednia and Brown, 1995), through two main modalities: TLX between practitioners and teleconsultation with patients assisted by other healthcare professionals.

1.2. From "experimental clinic" to real-life care settings: a practice-based study of TLX uses

The case of teledermatology has indeed proved to be a particularly valuable example for a study conducted by British researchers in the field of Science and Technology Studies, on the multiple recompositions of care practices and organizations through the development of telemedicine in the 2000s (May et al., 2001; Mort et al., 2003, 2007). This first study focused on the way in which patients' identities are "inscribed" (Akrich, 1992) and translated into multiple fragments of information, such as textual descriptions and iconographic representations that speak on their behalf. Through such artifacts, a new form of identity emerges in the context of TLX, that is different from the one that physicians typically encounter in a face-to-face consultation. This is the identity of a "tele-patient" whose multiple inscriptions are combined in different ways within a new regime of visibility, where it becomes possible to translate singular histories into measurable and mutually comparable cases, and to carry out clinical observations at a distance (Mort et al., 2003, 2007). Studying the implementation of TLX in a hospital department, the authors note that these practices delocalize and diffuse the technologies of inspection and enumeration (Atkinson, 1995) that originally contribute to the trend of "digitizing bodies" in hospitals (Andreassen et al., 2018), beyond the communities of specialized practitioners. The authors suggest that these practices could extend the scope of these objectification processes through which patient identity is inscribed in different forms (images, information, testimonies, samples, measurements, data, etc.), and the "clinical gaze" (Foucault, 1973) is distributed across locations and specialties (specialists, laboratories, patient records, etc.). TLX thus contributes to the generalization of the fragmentation process of the patient, as well as of the medical work, to other settings outside of the hospital, with which it establishes a link.

These observations were made in the specific context of a "clinical experimentation" implemented in a real-life setting, thus creating an "experimental clinic" (Mort et al., 2003). The TLX we are studying takes place in a completely different context, that of the institutionalization and standardization of practices through the implementation of socio-technical networks, i.e., dedicated digital devices based on more or less standardized forms, and socio-professional networks constituted by lists of experts who are *a priori* unknown to health professionals wishing to benefit from a specialized opinion. Today, more than ever, the need to preserve the integrity of the clinical gaze and, more generally, of patient care, is being tested by the implementation of these new frameworks, frameworks which seek to stabilize the ways of acting at a distance.[2] The introduction of these devices raises a number of questions, not only about the request procedure (profile and skills of requesters, methods of patient inscription, questions that can be asked via TLX, information to be transmitted to the requester, etc.), but also about the patient management processes (division of auscultation and treatment tasks, professional responsibility of practitioners, etc.). Practitioners often have to find answers locally, through a series of "compensatory" activities carried out to make the remote diagnostic work (Nicolini, 2006), without fragmenting patient care. This is compensated by the production of standardized protocols to precisely configure the roles and practices of the actors involved (Mort et al., 2003). But these activities also refer to a whole series of efforts that remain largely invisible from the perspective of the formal organization of work processes (Star, 1991; Star and Strauss, 1999; Oudshoorn, 2008; Trupia et al., 2021).

In the case of the TLX, the requested experts have to cope with the many limitations of the system and, in particular, the uncertain and unpredictable nature of the requests they may receive. These efforts are also those of the requesting physician, on whom their work now depends. Indeed, the requesters do not mechanically fill out a TLX form; they greet, interview and examine patients according to their intuitive investigation, take samples and produce the inscriptions, call patients back, reassure them and redirect them. Through a practice-based study that takes into account the adaptations made by practitioners in real-life care settings (Gherardi, 2010), this paper aims first to show how TLX creates, alongside to the new patient identity, also a new type of practitioner. The defining characteristic of this "tele-practitioner" is that he/she organizes his/her activity within the new TLX frameworks, in order to maintain the integrity of the medical knowledge production process and, more broadly, of patient care. While these frameworks organize an activity that already exists informally, they also end up producing a new TLX activity in which the fragmentation of the patient's identity, consultation, as well as work (between relational tasks and diagnostic tasks), cannot be understood without reference to the learning processes (David et al., 2003; Mathieu-Fritz and Esterle, 2013). Instead of "clinical Fordism", which inevitably leads to a loss of skills (Mort et al., 2003), as well as to a certain dehumanization of healthcare relationships (Roberts et al., 2012), it seems more relevant to analyze the fragmentation of medical work over time and within networks of practitioners, together

2 We use the term "framework" in a sense similar to that of the "dispositif" used by Dodier (1993), as a set of words, rules, and objects that can be considered both as resources and constraints for (inter)action, as they delimit a perimeter, define a field of possibilities and create a space of practice that guides and orients the judgment of individuals, in order to organize heterogeneous activities and forms of action.

with the continuous training of practitioners. In this approach, the study should examine how the recomposition of the territories of knowledge and skill benefits differently healthcare professionals who already maintain asymmetrical, or even hierarchical, medico-social relationships with each other, depending on their field of intervention.

While TLX involves the production of a remote diagnostic opinion, it is nevertheless part of a more global approach to patient care, some of whom will need to be seen during a face-to-face consultation following a TLX. The second objective of this article is to show that the implementation of framed TLX devices requires a far more profound restructuring of socio-organizational processes than was initially assumed (Sicotte and Lehoux, 2005). This restructuring is necessary not only to support telemedicine, but also to coordinate medical care after a telediagnosis among practitioners whose participation in the management of care pathways has been profoundly modified. The use of TLX is therefore rooted in a very concrete geographical reality, where its development is closely linked to the territorial context of the healthcare system. From medical demographics to the availability of care in different areas, from public policies on the development of telemedicine to concrete support mechanisms put in place by the authorities, the organization of TLX activities is dependent on a series of contextual elements in response to which physicians can develop a plurality of attitudes. The refusal to give an opinion on patients who are geographically distant, the provision of post-teledermatology consultations, and the creation of over-specialized care networks are some of the illustrations that will underline the importance of the socio-organizational processes and, more broadly, the conceptions of health care that make it possible to give an opinion at a distance.

2. Materials and methods

This article proposes to describe new forms of TLX use in dermatology to understand the profound transformation of existing practices and care organizations. It is based on a qualitative study conducted through semi-directive interviews with physicians using framed TLX in real-life settings ($n = 50$).[3] It was launched in 2020, with an initial series of interviews conducted with dermatologists using TLX at a university hospital in the Paris public hospital network. With the help of the French Society of Dermatology's Teledermatology and E-Health working group (TELDES), the survey was then gradually expanded to include dermatologists using TLX in other hospitals, as well as in private practice. A second wave of interviews is conducted in 2021 with dermatologists throughout France, practicing in very different territorial, institutional and socio-organizational contexts. In fact, it is only through such a diversification of experiences that it became possible to grasp the unique ways and the common logics according to which the use of TLX varies with the contexts of its adoption by its users (Akrich and Méadel, 2004). This article primarily includes the point of view of the requested experts ($n = 43$), but the study is also extended via the proximity method, to the requesting physicians ($n = 7$), whose point of view is essential for understanding how collaboration between healthcare professionals develops and evolves through TLX. Although these interviews are more limited, they allow us to vary the units of analysis of TLX use, which develops, for example, in the form of a correspondence between two practitioners who already know each other, or of a cluster of requesters who participate in the progressive constitution of a centralized network around a single department that responds to requests. Finally, additional interviews were conducted with representatives of a TLX platform, providing a comprehensive view of the development of TLX in France.

Two interview grids were designed, one for the requester and one for the requested, each based on several themes: socio-demographic characteristics, career path, activity and working conditions, TLX uses and subjective experiences, changes in use over time and, finally, perceived changes in care practices and organization. All interviews were transcribed anonymously and verbatim, before being subjected to a thematic analysis organized in several stages, based on the principles of grounded theory (Strauss and Corbin, 1998; Glaser and Strauss, 2009) and its applications in the field of healthcare studies (Kivits et al., 2016). The first analysis was carried out on the sample: professional career (age and position), practice conditions (hospital or private practice), territorial context (geographical location and medical demography) and clinical activity (severity of pathologies, degree of specialization required for treatment). Thus, the physicians can be at different stages of their career, where the use of TLX follows specific professional evolution rationales. The sample includes young medical students aged 20–29 ($n = 2$) and young professionals aged 30–39 ($n = 16$), as well as dermatologists aged 40–49 ($n = 3$), older dermatologists aged 50–59 ($n = 15$), and late-career or retired dermatologists aged 60–69 ($n = 7$).

The second part of the analysis focused on the adoption contexts, to reflect the diversity of local configurations in which TLX is used. The dermatologists interviewed are spread across France, in metropolitan areas such as the Paris region ($n = 17$), but also in more isolated locations in terms of medical demography, known as medical deserts, where it develops through very different logics and forms compared to large city hospitals. They practice medicine in very different contexts, in hospitals ($n = 20$), in private practice ($n = 23$), or in the context of a mixed activity ($n = 7$), where we find similar difficulties related to the lack of resources. Within the sample, a large number of dermatologists practice in university hospitals ($n = 14$), but also in smaller hospitals ($n = 5$), which sometimes have far fewer resources (equipment, personnel, etc.). These issues of unequal availability of resources and access to care are also reflected in the level of expertise required to treat certain pathologies. Dermatologists can be more or less specialized, for example in onco-dermatology, where TLX is of particular interest, but also in allergology, or in chronic wound care. These variations also apply to the case of requesters, who are healthcare professionals from other specialties (such as general medicine, oncology), with varying degrees of technical, financial, and cognitive capacity to submit a request and, more generally, to access TLX. In reality, while the framed TLX is a relatively recurrent activity for physicians who receive several requests per day, for many requesters it is rather occasional activity in their daily practice. This creates a great disparity between requesters who need to put significant efforts into implementing framed TLX, instead of TLX, which they had previously practiced informally, without any special equipment or knowledge.

3 The names given to participants in the text are pseudonyms.

Despite this diversity, it is important to note that the recruitment of participants through the TELDES group, introduces a bias in the profile of these physicians. For example, a third of the dermatologists are involved in the development of telemedicine projects, and are committed to sharing their experiences with teledermatology. Some are active members of professional networks and organizations where they lead discussion groups on the use of digital technology in healthcare. Others are researchers who conduct studies to demonstrate the effectiveness, i.e., the good concordance of telediagnosis with traditional face-to-face consultations (Duong et al., 2013, 2015; Thonnelier et al., 2015; Hirsch et al., 2018a,b; Bataille et al., 2019, 2021; Friedel et al., 2019; Ridard et al., 2020; Skayem et al., 2020; Démoulins et al., 2021).

Finally, a broader ethnographic approach completes this corpus, with observations made during several working meetings and professional conferences organized by scientific societies on telemedicine, as well as by various data and documents (review of the scientific literature produced by the participants, statistical databases elaborated by public bodies on medical demography, gray literature produced by professional organizations, press review of news on teledermatology, etc.). All these materials makes it possible to contextualize the study of TLX within the broader professional field of dermatologists, whose specificities need to be understood, not only at the level of their practice (diagnostic activities, conception of patient care, etc.), but also in terms of the internal dynamics of their professional community (role of scientific societies, learning dynamics, etc.).

3. Results

This article presents some of the key findings resulting from this broader research, in three main parts. First, we will examine the specificity of dermatology practice and describe the particular ways in which TLX is implemented in this field, as a new framework for an activity that is already part of dermatologists' daily routine. We will then report on the multiple efforts and skills required to make TLX work in this new framework, and present various uses of TLX in very different socio-organizational configurations. Finally, we will discuss how they transform dermatologists' usual practices, not only by creating a new type of activity, but also by enabling them to participate differently in the organization of care pathways.

3.1. Dermatology and TLX: from visible pathologies frames to new frames for an "invisible" work

Dermatology may seem like a natural fit for the development of TLX. Dermatologists work on a visible organ, the skin, and this has a major impact on the concrete activities involved in the care of dermatology patients. First, everyone has something to report on their skin, and the urgency of treatment requests does not always correlate with the severity of the pathology. Some problems are purely aesthetic and do not pose a threat to the health of individuals, but they can cause considerable discomfort and sometimes even become discriminating in their social interactions.

> *"The skin is the largest organ of the body. It has several functions, including a psychosocial one which is very important. It is in fact an interface with the outside world. [...] So you have to know that if a patient suffers from a skin problem, it immediately has an impact on his/her quality of life." (Camille, 30–35, hospital practitioner)*

Dermatologists agree that there is a very high demand for care, but ultimately for situations that are not always very serious from a clinical point of view. This creates a conflict of perspectives on the definition of a "skin problem", between its visibility in the patient's experience and its severity as clinically assessed by the practitioner. Even if some physicians try to exclude benign problems from their scope of practice, in order to focus exclusively on the care of patients who are "really" sick, most of them nevertheless include this aspect in the definition of their work. In fact, this is one of the most striking features in the evolutionary dynamics of this professional group, which has led to the differentiation between "medical" and "aesthetic" dermatology.

This visual aspect of skin diseases has a strong impact on the construction of the care relationship with the patient, as well as on dermatologists' professional commitment to their work. It also has an impact on the concrete reality of their practice, where they use their vision as their main working tool. Although they also mention the importance of touch in sensing manifestations beneath the skin, most of them insist more strongly on the centrality of the visual element in clinical practice, which is also a strong reason why some choose this specialty.

> *"In dermatology, the specificity is precisely the possibility of making a diagnosis, a very visual, very... clinical approach. We see the patient, we make a diagnosis." (Laurent, 30–35, hospital practitioner specialized in onco-dermatology)*

Dermatology is therefore particularly well suited to formulating a diagnostic opinion based on a photograph, without the need for additional examinations, as is often the case in many other specialties. Dermatologists have been accustomed to working with photographic images since their early years of training. They learn to look and develop a visual ability to recognize different pathologies. It is only when they see a large number of clinical cases that they become aware of the many types of skin lesions that exist and learn to recognize them, sometimes at a glance.

> *"Visual observation plays a primordial role in the experience, the fact of having seen the pathologies, and therefore knowing them. Because you need to have seen the types of pathology once to know how to recognize them." (Sophie, 35–40, hospital practitioner)*

> *"The dermatologist is like an elephant. The more things he/she sees, the more competent he/she becomes." (Clemence, 55–60, hospital practitioner, university professor)*

By transforming cutaneous manifestations into objects of knowledge, images are thus part of the learning process in dermatology. In particular, they enable dermatologists to develop a "professional vision" (Goodwin, 1994) that inscribes

ways of looking, but also of observing, inspecting and seeing, within professional identities and ideologies. As well as being the main tool for learning and gaining experience in diagnostic practice, images are also one of the most important working tools used by dermatologists on a daily basis, for instance, to capture skin lesions, determine their condition and monitor their evolution between two consultations. This is the case, for example, with certain drug allergies whose cutaneous manifestations can disappear rapidly. This "image culture" accompanied the development of dermatological practice long before digital technologies, with the intervention of photographers and the creation of photographic clinics in Parisian hospitals as early as the nineteenth century (Sicard et al., 1995; Neuse et al., 1996; Cribier, 2021). Even today, photographs are used in hospital medical staff meetings to study patient records and coordinate care for the rarest or most complex cases.

Since the development of digital photography in the 1990s and 2000s, and in particular the development of smartphones, which have facilitated the exchange of images, telediagnosis has become widespread, to the point of becoming part of dermatologists' daily routine. These practices, which existed long before the regulatory framework for telemedicine was established, refer in particular to what practitioners call "wild tele-expertise", which is carried out informally. These requests are sent by their professional entourage, but also by family members and friends, using traditional communication channels such as SMS, email and, more recently, mobile applications such as WhatsApp or FaceTime. Without exception, all the dermatologists interviewed receive photos of lesions and different body parts on their smartphones; the vast majority practice this form of TLX on a daily basis.

> *"It started as early as the internship when colleagues from other departments would ask us: "Here, can you tell me what you think?" to avoid the patient being moved, for example. [...] these things are quite common." (Christine, 40–45, hospital and private practitioner)*

These remote practices seem to be very common and much more fluid in real-life, where it is not always easy to distinguish telemedicine acts as defined by legislation. Requests via SMS and MMS, videoconferencing, telephone calls, online chat and files sent by e-mail are always combined in unique ways in the daily practice of dermatologists. When asked "Do you practice TLX?" during the interviews, dermatologists often reply: "It depends on what you mean by TLX". In reality, these practices evolve in a hybrid form, accompanied, for instance, by telephone calls between practitioners to contextualize the information transmitted, or a teleconsultation before which dermatologists ask patients to send photographs of their lesion. While this "clandestine" form of TLX refers to a daily practice for dermatologists, it can be also institutionalized over-time at the level of hospital units. Some dermatologists have set up an e-mail account for requests from other hospitals, or a telephone on-call system for requests coming from other departments in the same hospital where other specialists may discover certain lesions during the examination.

While dermatologists have long exchanged clinical information to provide remote diagnostic opinion,[4] new regulatory frameworks aim to secure, organize and improve these already existing practices. Firstly, they are defined in relation to the patient's context: TLX, like teleconsultation, is mainly reserved for people who have difficulty moving, either because they are in prison, because they are elderly and already receiving care in nursing home, or because they live in areas with low medical density ("medical deserts"). On the other hand, the development of framed TLX is much more closely linked to the context of the physicians' work, as it allows them to value a part of their activity that had previously remained invisible (Star, 1991; Star and Strauss, 1999), both from an economic and organizational point of view. With this new framework, giving an opinion becomes an identified and fully paid activity practiced within an organized network. After a long and demanding process, TLX procedures in France can be invoiced and reimbursed by the national health insurance fund, at a cost of 20€ for experts and 10€ for requesters. This new framework is also based on a particular organization of work which is no longer practiced within a network of inter-knowledge, as in its "clandestine" form, but within a network of correspondents, it is now institutionalized and configurable according to the preferences of the experts.

Beyond the financial and organizational principles, the new forms of TLX are also developing within a practical framework where a diagnostic opinion is produced with a set of constraints specific to the exercise of telemedicine. Experts give advice from a distance, asynchronously, without the presence of the patient and on the basis of an examination carried out by another practitioner who is not known in advance. This practical framework involves a particular division of work between the requester and the requested, for whom there is no reciprocity of roles or activities; the requester hardly ever finds him/herself in the role of an expert. The TLX network is composed by two groups of practitioners with very different roles and dissymmetrical relationships, in terms of territorial context (metropolitan areas or medical deserts) and resources (hospital or private practice, administrative staff, equipment, etc.), but also in terms of the knowledge and skills they mobilize in their daily practice (general practitioner, specialist, subspecialist). On the one hand, the requested dermatologists are often located in hospitals that centralize several fields of expertise and have a high concentration of specialists who can provide an opinion on the more complex cases. On the other hand, the requesting physicians are either other hospital's specialists (such as emergency physicians or oncologists), private dermatologists who generally treat more common pathologies and are considered less serious than in a hospital setting, or general practitioners who are mostly outside this network of experts and consult them on a more occasional basis.

In addition to the relationships between practitioners, this practical framework also structures their communication through

4 A study conducted in France by a telemedicine company estimates that the number of telephone calls made each year by primary care physicians to specialists in order to obtain a remote opinion is between 40 and 60 million (Simon and Moulin, 2022). Although this study may seem questionable, this estimate gives an indication of the scale of this expert activity, which is completely outside the scope of official healthcare organizations.

a particular format, i.e., a question and an answer, both formalized through writing, now transmitted through secure tools and stored in the information systems of healthcare institutions. This, of course, is not new in the medical world, where writing is often accompanied by oral communication to contextualize it (Grosjean and Lacoste, 1998). For the vast majority of the dermatologists interviewed, this format for providing written advice is consistent with the traditional referral letters used to coordinate care. However, this practical framework places the specialist in a very different position, as an advisor who does not necessarily commit to taking care of the patient in question, personally:

> *"The person who gives the advice deliberately puts himself, with this notion of optimizing his time, in a position which is: "I'm answering the question I was asked, that's it!" [...] when you are asked for an opinion, you are asked a question; well, you are going to answer the question: Yes! No! It's serious! It is not serious! And you won't go looking for additional information: "And, by the way, when was the last time you had your moles checked?"." (Jeanne, 40–45, hospital practitioner, university professor, teledermatology specialist)*

TLX asks the expert to make a medical judgment relatively quickly based on limited information, and to write a short and concise answer that leaves little room for the doubts and uncertainties surrounding this activity. Some dermatologists say, "You need strong nerves to do TLX". Furthermore, experts have to formulate an opinion based on information provided by an unknown practitioner, with whom they do not necessarily share the same representations of dermatology, nor of TLX. This way of structuring relations and communication requires a whole series of informational, cognitive and social couplings (Sicotte and Lehoux, 2005) between the two doctors, who are located in very different institutional and territorial contexts, and who do not have the same technological or organizational resources at their disposal to make the system work. This is what we propose to study in the second part of the article, where we will analyze the concrete ways in which a diagnostic opinion is produced in this new framework, through a series of additional efforts and tasks that practitioners must carry out in order to integrate these devices into their daily practice.

3.2. How to make TLX work? Efforts and skills needed to produce a diagnostic opinion remotely

This second part of the paper proposes to analyze all these efforts made by both the requester and the requested physician, to adapt their practice to this new framework and to "make it work" in a way that they consider acceptable and effective (Nicolini, 2006; Trupia et al., 2021). In practice, TLX tools mainly take the form of a relatively simple communication interface, with varying degrees of sophistication depending on the system. For example, TLX can be used through encrypted messaging services, where it takes the form of a free text field in which the requesting physician writes his or her request, like an email. Requests for advice can also be more clearly structured within regional telemedicine platforms developed by institutional operators, or through online services developed by private companies. In those cases, the TLX can take the form of a fairly standardized questionnaire with more or less restricted queries (nature of the request, patient information, pathology history, etc.) and fields to be filled in by the requester, including the upload of photographs of suspected lesions.

The integration of TLX into daily practice raises a number of questions that both physicians often have to answer locally, depending on the specific context of their activity. From the expert's point of view, these questions are mainly related to the configuration of the system, starting with the request procedures. Who can request an opinion? On what can an opinion be requested? What is required to formulate a request for advice? Which information must be provided? TLX tools often allow experts to set these parameters. However, efforts to make TLX work go well beyond simply configuring the tools beforehand. The reason is that, while dermatology may seem to be particularly well suited to TLX, it is not always easy to form an opinion from distance, through the interrogation and examination conducted and translated by an intermediary. Indeed, the diagnostic activity is challenged by TLX, where it is no longer a matter of directing one's own vision at the patient's body, but of interpreting clinical information gathered and material produced by another practitioner according to what he/she thinks needs to be known and seen. These challenges are well illustrated by the difficulties in interpreting photographic evidence produced by the requesters. Dermatologists need to be able to see the color, size and relief of lesions. They use a special device to observe lesions on a microscopic scale, the dermatoscope, which allows them to standardize these aspects. In TLX, however, they usually receive images whose characteristics vary considerably depending on the environment and the equipment used to produce them. For example, the brightness and sharpness of the images are often inadequate in the eyes of the dermatologist. As a result, many experts ask requesters to redo the photographs:

> *"There is the quality of the photos that can be lacking, there is the number of photos, the incidences, the luminosity, there are sometimes photos that are not very clear, that are a bit blurry. [...] the light that is missing, photos that are missing, shots that are not adapted, a focus that is made on the background and not on the skin." (Christophe, 40–45, hospital practitioner)*

These difficulties can also result from the varying configuration of the equipment each practitioner use. For example, certain nuances or "color tones" that are important in making a diagnosis in dermatology may be less pronounced or, on the contrary, can be amplified in the photograph:

> *"Sometimes, you will have the impression of seeing blisters, when there are none, or of seeing red, less red... or even of not having the notion of bluish... these are color notions that can disappear a bit, or on the contrary, be aggravated by the photo." (Jeanne, 40–45, hospital practitioner, university professor, specialist in teledermatology)*

Dermatologists face many difficulties related to the image taken by a requester who does not necessarily recognize which lesion

is of most concern. In fact, one of their main concerns, is that the requester may have selected the wrong lesion and sent them a photo of a benign one, when there was a tumor lesion right next to it. In fact, while both physicians are in medical practice, they do not conduct the same interview or clinical examination. Their attention is not directed by the same set of signs. If during teleconsultations, the challenge for the required is to orient the requester and delegate certain tasks (Mathieu-Fritz and Esterle, 2013), the greatest difficulty of TLX is to establish a common understanding of what constitutes a complete medical record. The framing of images provides a striking example of such difficulties:

> *"Sometimes the photo is of good quality, but it is not informative because the choice of the lesion is poor. For example, too close a shot! I need to step back a bit. That's the big question we asked ourselves: how far away should we be from the lesion." (Gérard, 50–55, private practitioner)*

In dermatology, a picture is worth a thousand words, but to create a picture that speaks for itself, it is necessary to understand the expectations of the experts, whose sensitivities can also vary greatly from one dermatologist to another. Faced with this variability, requesters must learn to ask the right questions to the patient, provide the relevant information to the expert, and produce images that adhere to current norms in the presentation of bodies and skin manifestations in dermatology. In some regions, health organizations in charge of telemedicine development offer to equip general practitioners with a dermatoscope to produce standardized images, in order to facilitate the integration of TLX use in their daily practice. However, for some dermatologists, this is not enough; it is also necessary to train, or even "educate" the requesters to formulate a proper TLX request:

> *"We have to educate people on how to properly request advice. In the end, it doesn't take much. A little experience. But we are very dependent on the quality of the request. An e-mail requesting our opinion, with a photo taken from a distance, pixelated, a "what is it?", and nothing else, will not be the same as a request with a good quality wide shot photo, a series of photos close to the lesion, and then a complete and faithful clinical description, both of the patient and the lesions, the history of their appearance, etc. So in fact, it takes time. A lot of time... maybe more time than we want to put in it." (Laurent, 30–35, hospital practitioner specialized in onco-dermatology)*

Some expert dermatologists involved in the implementation of a TLX system, either as part of their hospital duties or as private practitioners in a local care network, position themselves as "recruiters" and they accompany general practitioners in a more or less formalized training. The requesters are trained in photographic techniques, but also in certain basic dermatologic observation methods and standards for identifying the most suspicious lesions. Some organize visits to the requesters' workplaces, while others offer a videoconferencing presentation that they have perfected over the course of their interactions with the requesters. Most of this learning, however, comes through the actual practice of TLX: requesters learn more on the job, through the experts' successive demands to complete the patient's clinical presentation.

> *"TLX means that we will ask an expert in the field and that, as a result, we can learn from his experience. After 4 or 5 times, with the same problem, the same course of action, the requester can appropriate it if it's not very complicated." (Bernard, 30–35, hospital practitioner, active member of TELDES)*

Thus, the requester must be invested to make the TLX system work. In the beginning, he/she must devote time to learn and equip him/herself to produce correct photographs. He/she must also acquire new skills: how to show, how to describe, how to fill out forms, but also how to respond quickly when the expert asks for additional information. Over time, an alignment, a cognitive and social coupling takes place between the requester and the requested expert, the former becoming increasingly competent in recognizing lesions, but also in formulating a request for advice (selecting the information to give, the questions to ask, etc.). A common language is developed during these exchanges where the inter-knowledge and, most importantly, trust between the two practitioners are central for the routinization of the TLX in their daily practice. It is also in this context that certain practices are difficult to generalize to the entire network of experts; in the vast majority of cases, the requester sends his request to the same dermatologists:

> *"There's a whole training of photographic quality to do. But once you've got that, you're good. Uh... as long as it is with the same correspondents!" (Frédéric, 65–70, retired hospital practitioner)*

Obviously, the formulation of a remote diagnostic opinion depends very strongly on the quality of the entries produced by the requesters. However, the interpretation of these fragments of information also depends on a number of other elements related to the patient's context or to the psychosocial dimension of the consultation, which can be crucial in defining a care management strategy. These elements cannot always be included in the inscription process, which is difficult to standardize. In the vast majority of cases, dermatologists receive incomplete information, sometimes incomprehensible, other times partial, and often difficult to process. Most of this information is itself a transcription made by a third party. Many experts insist on this dimension of TLX: the inscription of patients through photographs of their lesion and fragments of their body is added to a second level inscription in which the requester transcribes the patient's clinical information, through the prism of his/her own conception of questioning:

> *"This is not our questioning. That's very important. There's this bias because it's how the doctor analyzed the context, and sends us this request. Moreover, it is a photo diagnosis, so we cannot see the lesional elements, we cannot palpate, we cannot examine the whole body. Sometimes they send us a photo of an arm and they tell us that yes, there are lesions on the back and legs and we don't have these photos. So sometimes, we don't even have access to the whole clinical examination." (Camille, 30–35, hospital practitioner)*

However, it is very difficult to establish a standardized procedure for collecting in a single time all the information

considered relevant to make a diagnosis on a photograph. Some requested experts participate in the definition of a protocol as a questionnaire composed of a set of closed questions to which requesters must answer in order to send a request. For others, it is impossible to codify an interview dynamic similar to a consultation: the relevance of certain questions is revealed progressively during the interview, according to each new piece of information communicated by the patient to his doctor. Similarly, this questionnaire cannot contain all the elements that reflect the uniqueness of each case and that must be taken into account either in formulating a diagnostic opinion or in choosing an appropriate treatment strategy. Some TLX systems offer a more succinct interface that leaves the requester free to describe the situation, like a letter of address, in addition to a few photographs and some basic information (age, sex, patient's request, etc.).

Dermatologists using this type of system reports that some requesters send a message consisting of only a single photograph and a question: "What is it?" without any other words of description—or even of politeness. This extreme case illustrates a specific dilemma of TLX. In fact, dermatologists report that in very specific cases, such as the detection of melanoma, they are relatively comfortable producing an opinion within a quarter of a second. However, in the majority of cases, they state that it is impossible to make a definitive diagnosis without any information about the patient's medical history, for example. Therefore, when the system allows it, there are several exchanges where the requested expert asks for more information. These exchanges are an integral part of the TLX activity. It is indeed an interaction. But not the kind of interaction required to constitute a complete interrogation. Most dermatologists insist that after a few exchanges, the system becomes time-consuming and loses its initial interest:

> *"[...] there is a multitude of cases where the diagnosis is not clear or it is impossible to make, which requires a lot of clarification, with additional emails, even calls, asking other questions, re-evaluations based on complementary exams or with a treatment trial, which take a lot of time, which are imperfect and which, for me, are not deleterious... I think that an opinion that requires an exchange of more than 3 messages is an opinion that should have gone through a physical consultation" (Laurent, 30–35, hospital practitioner specialized in onco-dermatology)*

> *"[...] all rashes, it's a little complicated if you don't have any context at all. And yes, what you want to do is call the patient, and ask questions. But if you do that, then there's more to it, and it's a consultation. So we do a bit with the elements we have. I always try to answer a little bit and then say: "to be watched". If there is a need, we see him again in consultation." (Dominique, 35–40, hospital practitioner in charge of setting up a telemedicine network)*

Similarly, the required experts must also make some effort to make TLX work in a way that is considered efficient, i.e., to save time. They must formulate an opinion in a few exchanges with the requesters and be willing to decide with "what they have in hand", taking the fear of being wrong upon themselves. While the legal responsibility is shared between the two parties, the practitioners also develop a plurality of attitudes regarding the relatively uncertain status of TLX. For some dermatologists, the framed TLX would be more binding than a "clandestine" advice sent by text message. Easily traceable, it would engage their professional responsibility. As a result, these practitioners report paying more attention in framed TLX. For others, the responsibility lies entirely with the requester, who is in charge of the patient's care. For them, it is the requester who sees the patient and writes the final prescriptions. They say, "We can't be responsible for what we are not being shown!".

To compensate for these uncertainties related to the inscriptions modes of the requester and to the patient's context, all of which remain very variable according to the configuration in which TLX is used, the required experts also develop a plurality of "ways of doing things" (Certeau, 1990) when formulating an advice. Some are very concise, by limiting their response solely to the question asked, without taking a full history of the patient as they would in a classical written letter. Others, on the other hand, expand their answer with additional explanations and references to scientific articles, by multiplying the differential diagnoses, by developing "guidelines" through standardized formulations, and by proposing treatments according to different evolution scenarios:

> *"In TLX, when I go through the secure application, I always reply "within the limits of the photographs sent, we can evoke this and that. I suggest this, if failure, do this". I do have a brief report, which is much less complete, but I still try to give details." (Julie, 40–45, private practitioner)*

Sometimes the requested expert call directly their interlocutors to ask additional questions and agree on the care strategy. For example, they may call the requester to ask for more photographs, or to find out if the patient already has a dermatologist in his/her area of residence, or if he/she has any mobility restrictions. The requester must set-up a proper organization to support the practice of TLX: he/she must arrange spaces and consultation times to take photographs and fill out request forms, but also call back the patient, either to take more photographs, or to announce the expert's answers and organize the follow-up. The requested physician must also establish a specific organization to respond to requests in a timely manner. Some rely on a system of on-call dermatologists who respond to requests for advice at any time, regardless of the previous experts who initially opened the request. Others follow requests from beginning to end, sometimes even during their sabbatical.

The integration of framed TLX into daily practice requires a restructuring of professional and organizational processes that is more or less profound depending on the context of their users. It also requires thinking about the management of tele-experienced patients who would need to be seen in the context of a face-to-face consultation after a TLX. For example, some experts categorically refuse to give remote advice on patients they cannot see in person, or on a patient who has received TLX by another practitioner. Others call patients back directly to schedule a "post-teledermatology" consultation, which they now add to their timetable in advance. Thus, practitioners develop a plurality of uses that differ according to the unique way they conceive and integrate TLX into their work process. This is what we propose to analyze in the third part, where we will present

different development logics for the use of TLX, within a plurality of socio-organizational configurations.

3.3. Between public health service, patient triage, and creation of new specialized care networks: TLX in different socio-organizational configurations

For the vast majority of the dermatologists interviewed, it is very difficult to imagine a clinical practice in dermatology without ever seeing patients. This is the reason why some choose this specialty, where the physician can care for his/her patients in a relatively independent manner, performing further examinations, *ad hoc* analyses or surgical procedures on his or her own. For many, TLX is therefore a limited, constrained activity that will never entirely replace traditional care, and which is legitimized mostly by the context of dermatology practice in France. The medical literature on teledermatology systematically recalls two major trends: on the one hand, the aging of the population comes with the growth in the number of certain pathologies, such as skin tumors and chronic wounds, which require specialized and regular follow-up, especially for fragile patients who are often difficult to mobilize. On the other hand, the decrease in medical demography is leading to longer waiting times for a dermatology consultation. In France, the French Medical Association estimates an average density of 3.5 dermatologists per 100,000 inhabitants.[5] With a massive wave of retirement and a significant decline in private practice in 2021, estimated at around 30% by French government's Directorate for Research, Studies, Evaluation and Statistics (DREES),[6] some rural areas, such as Creuse for example, do not have a single dermatologist left. It is in this context of growing tension between the increase in demand and the decrease in the provision of care that TLX is implemented as a means to improve access to care in remote and rural areas, but also as a way of reducing consultation times, which can be as long as 6 months even in metropolitan areas. A variety of TLX uses are emerging to address the growing shortage of dermatologists, depending on the organizational context, specialty, and level of specialization of healthcare professionals.

In fact, TLX can be integrated into a wide range of configurations, notably in primary care (between general practitioners and specialists) and in secondary care (between private and hospital dermatologists whose work is more specialized). Sometimes TLX can be used in tertiary care (between specialized and subspecialized dermatologists) for the diagnosis of rarer or more complex pathologies whose management requires more advanced equipment, treatments or procedures in hospitals. While the common intention is to improve access to care by facilitating the circulation of knowledge between these different healthcare professionals, the most innovative aspect of framed TLX is not the activity of remote diagnosis. Indeed, TLX systems enable practitioners to participate in the definition and, therefore, in the organization of the very modalities for requesting medical expertise. In particular, the requested physician can define the scope of the requests that he/she is willing to receive. Some specialists accept requests from all other healthcare professionals, including nurses and even pharmacists who suspect melanoma on a patient. However, for other dermatologists who are more specialized, the scope of these requests may be much narrower. This is the case for this specialist who categorically refuses requests from non-physician healthcare professionals:

> *"I try to be second or third in line, behind general practitioners or behind dermatologists, if they need to send me patients for medications that are a little complicated to manage in private practice. Or to do skin surgery. So I see quite a few skin tumors." (Bernard, 30–35, hospital practitioner, active member of TELDES)*

In a hospital environment, some practitioners have developed a higher degree of specialization that allows them to deal with rarer or more complex pathologies. In such cases, TLX makes it possible to regulate the opening up of hospital care according to the problems of organizing primary and secondary care. For some hospitals located in areas where there is a significant shortage of dermatological care, this opening is inevitable. The specialists receive all kinds of requests for patients who are geographically distant, often commuting from neighboring areas. The typical example is that of primary care physicians located in medical deserts requesting an opinion from private dermatologists or hospitalists regarding a suspected melanoma that they have identified in their patient. However, many dermatologists report more misdirected use of the TLX, where colleagues in private practice send requests not to obtain a diagnostic opinion, but mostly to reduce waiting times for a dermatology consultation. In such cases, the requesters' objective is to find a dermatologist for his/her patient who needs rapid treatment. In this context, new forms of TLX use are developing based on a broader concept of care: dermatologists consistently state that what motivates them the most in doing TLX is "to be of service" to both their colleagues and patients, even if this constitutes an additional workload. However, this is not enough to solve the problem of shortage of dermatologists, as patients still need to find a dermatologist when they need further evaluation and treatment. In some cases, the expert can delegate and assist requesters in performing certain procedures such as biopsies or minor surgery. Very often, however, experts associate the TLX advice with a necessity to ensure the integrity of patient care. A new type of consultation called "post-teledermatology", is being set up by experts in, both hospitals and private practice, to follow-up on patients who have undergone TLX.

While the use of TLX evolves according to the specific territorial context of health care provision, this rationale does not apply to situations requiring a higher level of specialization to identify and treat skin pathologies. This is particularly true for requests addressed to large university hospital centers, such as the one located in the Paris region where the survey was initiated. This hospital has two specialties that illustrate how the use of TLX also varies according to the nature of the requests and the level

5 See the DREES open database: http://www.data.drees.sante.gouv.fr/ (accessed January 2023).

6 See the report published in March 2021: "Quelle démographie récente et à venir pour les professions médicales et pharmaceutique? Constat et projections démographiques". Les dossiers de la DREES, n. 76 (p. 15).

of expertise required to treat them. The hospital's dermatology emergency unit is one of the leading in the region, and the only one with a 24-h on-call dermatologist to respond to urgent requests at short notice. The dermatology service also centralizes several medical specialties, including toxidermia (skin lesions due to drug reactions), and certain rare pathologies. Dermatologists thus receive requests for all kinds of advice, ranging from the most common cases with no real danger to the patient's health, to the most "special" cases involving rarer pathologies or more complex situations (e.g., in the presence of co-morbidity). Compared to the traditional appointment scheduling by a telephone secretary or online booking, TLX has the advantage of creating a new visibility regime that allows the specialists to identify the patients who need to be seen as a priority. In this context, the TLX is used by hospital practitioners to select the most serious or urgent cases to be treated, among all the requests that the hospital receives daily through multiple channels.

A prime example of this triage process is the use of TLX in the early detection of skin cancer to prevent it from metastasizing. In this context, requests for TLX are often presented as a simple yes/no question:

> *"TLX is a photo analysis [...] for one question: "Is it a tumor or not?" [...] So, in fact, the diagnosis in the sense of "I made a very good diagnosis today" is not really what we are looking for in TLX. What we're looking for is to avoid making a mistake in the "serious or not serious?", in the "it's important or it's not important?". Because most of the time, the issue is to know if it can wait until a real consultation." (Jeanne, 40–45, hospital practitioner, university professor, specialist in teledermatology)*

Although some dermatologists consider TLX to be well suited for this type of lesion screening, oncodermatology remains one of the most cautious practices for specialists. The goal is to detect malignant lesions as early as possible, when signs are not always easy to detect. In some cases, a simple mole that is not well photographed may result in the patient being called in by the specialist, to perform the examination him/herself during a face-to-face consultation. While TLX works for some relatively simple cases, it is not always effective for this type of early detection. Nor is it considered the most appropriate solution for more complex situations that require greater specialization. This is the case, for example, with subspecialized dermatologists who practice TLX in a more peripheral way. Like this dermatologist who specializes in skin allergies, most of them only respond to requests related to their own subspecialty. "TLX chains" can be formed as an "opinion on an opinion", making it possible to organize care in tertiary or even quaternary care, after the general practitioner, the general dermatologist and the specialized dermatologist. TLX creates a paradoxical situation in which a diagnosis must be made at a distance, for complex situations, where others have not been able to identify the pathology even through a clinical examination:

> *"If you are asked, it's because your colleagues don't know. And sometimes it's a real puzzle. That's the hard part, if you will. You are asked to find solutions in situations that are by definition complicated, since others have not succeeded, and you will not necessarily be able to do so immediately either." (Alicia, 60–65, hospital practitioner, university professor)*

In these cases, the challenge is not always to make a diagnosis. Rather, specialists see TLX's greatest value in triaging the most urgent or severe cases. In the context of onco-dermatology, where the waiting time due to difficulties in accessing care represents what specialists call a "loss of chance" for the patient, the goal is to prioritize the treatment of the most advanced but treatable tumors. In these situations, where the diagnosis has already been made, TLX is primarily used to accelerate the beginning of the treatment process. In onco-dermatology, this requires patients to be "brought in" for additional testing or for hospitalization to remove suspicious lesions. Thus, a vast majority of TLX performed in onco-dermatology may result in a traditional, face-to-face consultation. TLX makes it possible to prepare these consultations in advance and, if necessary, to "win" a consultation—i.e., to avoid it, that of the first meeting with the patients, or sometimes even their second visit, if we consider the "pre-surgical" consultation. Sometimes the specialist is able to remove the lesions at the very first meeting with the patient he/she has tele-expertized beforehand.

In a context where demand is particularly high, TLX allows specialists to assess by themselves, prior to consultations, the severity of the pathologies they will be able to "choose" for treatment.

> *"It is a tool that is becoming essential and that I will surely use in my future practice to manage emergencies, to see which patients need to be seen, and at the same time, to reorganize myself and try to ease my face-to-face consultations." (Camille, 30–35, hospital practitioner)*

While TLX allows prioritizing, it also makes possible for experts to define the selection criteria themselves. For some, this allows them to further the logic of specialization by "recruiting" pathologies they consider interesting from a professional point of view. For others, on the contrary, TLX offers the chance to come out of it, by seeing a greater diversity of cases:

> *"Me, what I really like is doing small procedures, performing instrumental dermatology. So through TLX, we're recruiting a lot more dermatology surgeries and lesions to be removed. When someone calls, the secretary is not going to know if it's surgical, even though I asked to prioritize the suspicious lesion, the unique lesion, the lesion that's changing, etc. that is potentially surgical." (Nicolas, 50–55, private practitioner)*

> *"TLX allows us to keep up to date in all areas, because when we are hospital doctors, we often have very specific, over-specialized consultations. And here, we see everything, it covers the whole field of dermatology and I find that interesting." (Sophie, 35–40, hospital practitioner)*

Practitioners apply the optimization logic of using TLX as a triage tool, to the daily organization of their own practice. In particular, the new TLX visibility regime offers more "grip" (in the sense of support for action) compared to the traditional re-addressing mail sent by the treating physician. This is undoubtedly the most significant change brought about by framed TLX, in terms of the organizational and professional restructuring of practitioners' activities. In traditional care coordination, it is usually

the primary care physicians who refer patients to specialists. TLX reverses this organizational logic: the specialist can now intervene directly, not only in the selection of patients and diseases, but also in the division of labor and responsibilities between the various actors involved in the organization of care. This is the case of these hospital dermatologists, who see TLX both as a means of recomposing this organization and of developing new care pathways in the management of certain pathologies:

> *"We get a lot of requests from other hospitals and if we find that the reasons are complicated or need to be taken care of, we redirect them. So a whole circuit is set up to facilitate exchanges between hospitals, services, general practitioners' private practices, intensive care units, emergency rooms, etc." (Camille, 30–35, hospital practitioner)*

> *"I think that TLX is useful for creating care networks, i.e., tumor networks, chronic wound networks, emergency networks, or even pediatric networks. That's why it's interesting, to have either hyper-specialized or referential contacts in these fields, or to go faster, or with multidisciplinary teams. In the example of tumors, the general practitioner sends the patient to a dermatologist who makes a diagnosis. Maybe you need a surgeon at the end of the line to remove that tumor." (Bernard, 30–35, hospital practitioner active member of TELDES)*

A striking example of these uses of TLX is the creation by two private onco-dermatologists of a remote multidisciplinary staff meeting platform between private dermatologists, anatomopathologists and surgeons, brought together at the request of a plastic surgeon, in order to manage skin cancers. While this type of network already exists in the hospital setting, the formalization of TLX activities allows for the creation of more hybrid networks involving increasingly heterogeneous health professionals, particularly in the primary care setting.

In short, TLX offers new "grips" to organize physicians' activities differently. However, physicians use it in different ways, depending on the context in which they practice, whether in metropolitan areas or in medical deserts, but also depending on the severity of the pathologies and the level of specialization required to treat them. While some experience TLX as additional work, to be of service, others integrate it into their work process as a triage tool to reorganize their daily consultation practice. This organizational and professional reorganization of work is more pronounced in the case of certain practitioners who see the development of TLX as a means of improving coordination between healthcare professionals, sometimes to the point of creating more hybrid care networks.

4. Discussion

In this article, we have outlined the main analytical perspectives opened up by our research. We have identified the way in which the use of TLX varies according to the four main variables inherent in the specific context of different categories of users. The latter develop a plurality of ways of doing things, depending on their professional trajectory (age and status), the practice conditions (hospital or private practice), the territorial context (geographical localization and medical demography) and the clinical activity (severity of the pathologies, level of specialization required to treat them). Through a practice-based study of the framed use of TLX, integrated into the work processes of routine care, the article also proposes an important contribution to the reflections first initiated in a more experimental context, on the impact of new digital technologies on dermatological care practices and organizations.

First, it shows how these new forms of TLX engage practitioners in a slightly different way than did the informal TLX. Framed TLX ends up producing a new kind of activity, an activity in its own right that doesn't necessarily overlap with existing practices. It refers to certain ways of doing things, paying special attention, acquiring new habits, and developing new knowledge, mostly on the spot, *in situ*, to "make it work". Second, formalized TLX produces a significant shift in the way in which practitioners participate in care coordination. In fact, while TLX is initially implemented to improve access to care in "medical deserts", it is also used to sort out urgent cases that need to be seen quickly in a face-to-face consultation. This focus on the use of TLX as a triage tool highlights the contrasting effects of these systems on the coordination logic between the actors typically involved in organizing care in dermatology. It shows how the use of TLX can vary according to the dermatologists' medical practice, not only at the level of work activities, but also in terms of the plural conceptions of health care and professional commitments that feed the integration process of these new systems in very different socio-organizational configurations.

4.1. Clandestine TLX, experimental TLX, framed TLX: from activity frameworks to new practices

The idea that telemedicine is a new practice, different from the regular clinical activity that takes place in the context of face-to-face consultations, is not new. It has been formalized by a whole series of works that we cited in the introduction, on the reconfiguration of care practices and relations in telemedicine (Mort et al., 2003; Oudshoorn, 2008, 2011; Gherardi, 2010). These works, carried out through an ethnographic approach and within the theoretical tradition of STS, show in particular that remote care practices must be considered as a type of care that is fundamentally different from conventional care, in which the interaction between technology and the local context is essential (Oudshoorn, 2009; Pols, 2012). This article extends these observations and this analytical approach to the case of framed TLX, whose implementation does not simply involve the development of a technical solution to secure the exchange of clinical information, but rather the creation, sometimes from scratch, of a new medical care network. More than just a mere regulation of existing activities, the TLX framework never entirely replaces them. Different from conventional care, but also from clandestine tele-diagnostic, framed TLX refers to new socio-technical arrangements, within which it is developed

as a new activity, an activity based on a set of know-how and a specific organization to cope with the constraints inherent to the practice of telemedicine, namely the fragmentation dynamics of the patient's identity, as well as of the consultation setting and the practitioner's work.

Confronted with these observations made by British researchers in the case of experimental TLX, this article shows that such practices also have a certain continuity with the ways in which patients are inscribed in educational settings. As a learning medium, it is more through images that patients are inscribed in dermatology, especially in the form of "clinical cases". Our hypothesis is that the use of images in TLX, while it contributes to the generalization of this fragmentation among increasingly heterogeneous practitioners, also extends the pedagogical logics into the daily practice of these practitioners. In particular, the study reveals the increasing competence of the requesters, which the specialists notice by observing the decreasing number of requests addressed to them by the same requesters. The use of TLX must therefore be understood in terms of a recomposition of knowledge fields that is reflected not only in a transformation of medical practices, but also in a professional and organizational restructuring of activities.

4.2. Transformational effects of TLX in the coordination of care in dermatology

In addition to the day-to-day activity of providing remote advice, TLX also refers to a coordination mechanism that makes it possible to sort out urgent cases, reduce delays, facilitate patient care, and, ultimately, create new care networks for rare and complex pathologies. By comparison, the experimental uses of TLX initially seemed to be much more prosaic than the promoters of these new systems had claimed (Mort et al., 2003). In particular, researchers recalled the project of a globalized organization of care that would connect healthcare professionals across institutional and geographic boundaries, in an entirely de-territorialized care network. This observation is true today at the scale of certain countries such as the United States, where telemedicine, and TLX in particular, can be implemented without regard to the regional specificities of health systems. Our research shows that these practices evolve in ways that are closely correlated with the institutional, regulatory and financial organization of national health systems. Rather than focusing on the production of a global healthcare organization, the authors suggest studying practices at a very local level. Our research also uses this approach, which is more interested in the concrete reality of practices, and shows how TLX activities develop in France according to specific conceptions of health care. However, it leads to a significantly different conclusion.

Indeed, it is rather surprising that an innovation with such a thin technological layer could lead to such profound practical and organizational changes. Ongoing analyses of the empirical material have revealed a number of paradoxical situations through which the effects of TLX have not yet been fully revealed. Indeed, while the initial goal of TLX is to improve access to care in areas suffering from a shortage of specialists, these new systems also require regular contacts between requesters and requested to work properly. Similarly, while the initial goal of TLX is to allow requesters to seek expertise that they do not have themselves, these practices assume that the requesters have a minimum level of expertise to identify suspicious lesions and formulate a request for expertise. These paradoxical situations, as well as the multiple efforts that users must make to "make TLX work", represent real barriers to the integration of these practices in contexts characterized by a shortage of specialists. In particular, the study shows that these conditions encourage the development of deviant uses of TLX, especially around the triage of patients using criteria that vary according to the practitioner, in order to improve coordination mainly between specialists. In this context, the systems that were initially implemented to improve access to care in rural areas, can also act as a filtering tool for prioritizing patients at the entrance of large hospitals in metropolitan areas, thus reshaping the inequalities in access to care through clinical criteria for defining serious or urgent cases, as well as through new ways to make these cases visible.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by the Institutional Review Board of Henri-Mondor University Hospital. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

All authors contributed to conception and design of the study. DVT and TAD set up the research environment, including writing the research protocol, filing the application with the research ethics board, and relaying the research to different socio-professional networks to recruit participants. DVT conducted the research, transcribed interviews, performed the thematic analysis, and wrote the manuscript. AM-F and TAD contributed to the interpretation of the empirical materials through the lens of their expertise. AM-F contributed to manuscript revision, read, and approved the submitted version. As a result all authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Akrich, M. (1992). "The description of technical objects," in *Shaping Technology/Building Society. Studies in Sociotechnical Change*, eds W. Bijker and J. Law (Cambridge; London: MIT Press), 205–224.

Akrich, M., and Méadel, C. (2004). Problématiser la question des usages. *Sci. Soc. Santé* 22, 5–20.

Andreassen, H. K., Dyb, K., May, C. R., Pope, C. J., and Warth, L. L. (2018). Digitized patient–provider interaction: how does it matter? A qualitative meta-synthesis. *Soc. Sci. Med.* 215, 36–44. doi: 10.1016/j.socscimed.2018.08.036

Atkinson, P. (1995). *Medical Talk and Medical Work. 1st Edn*. London: SAGE Publications Ltd.

Bashshur, R. L., Shannon, G. W., Tejasvi, T., Kvedar, J. C., and Gates, M. (2015). The empirical foundations of teledermatology: a review of the research evidence. *Telemed. e-Health* 21, 953–979. doi: 10.1089/tmj.2015.0146

Bataille, M., Mahé, E., Dorizy-Vuong, V., Skayem, C., Dompmartin, A., Richard, M., et al. (2021). French teledermatologists: activity and motivations prior to the COVID-19 pandemic. *Acta Dermato. Venereol.* 101, 3836. doi: 10.2340/00015555-3836

Bataille, M., Mahé, E., Vuong, V., Dompmartin, A., Richard, M.-A., Debarbieux, S., et al. (2019). Profil du télédermatologue en France en 2019. *Annal. Dermatol. Vénéréol.* 146, A241. doi: 10.1016/j.annder.2019.09.377

Certeau, M. (1990). *L'invention du quotidien*. I. Arts de faire. Paris: Gallimard.

Cribier, B. (2021). Le dermatologue et la photographie: Photography and dermatologists. *Annal. Dermatol. Vénéréol. FMC* 1, 8S53–8S58. doi: 10.1016/S2667-0623(21)01024-2

David, A., Midy, F., and Moisdon, J.-C. (2003). Les TIC restructurent-elles?: Péripéties de deux réseaux de télémédecine en périnatalité. *Revue française des affaires sociales* 3, 79–94. doi: 10.3917/rfas.033.0079

Démoulins, E., Rat, C., Martin, L., and Mamzer, M. F. (2021). Teledermatology practices: Benefits, limitations and perspectives. Qualitative interview-based study with dermatologists. *Ethics Med. Public Health* 16, 100631. doi: 10.1016/j.jemep.2021.100631

Dodier, N. (1993). *L'Expertise médicale : Essai de sociologie sur l'exercice du jugement*. Paris: Métailié.

Duong, T. A., Boudjemil, S., Canoui-Poitrine, F., Begon, E., Carlotti, A., Fontaine, J., et al. (2013). *Évaluation d'une application internet de téléexpertise en onco-dermatologie: étude TELDERM1*. /data/revues/01519638/v140i12sS1/S0151963813009423/. Available online at: https://www.elsevier-masson.com/en/article/853960 (accessed April 23, 2020).

Duong, T. A., Farel, R., and Le Cardinal, J. (2015). "Emerging telemedicine analysis of future teledermatology application in France," in *Modelling and Management of Engineering Processes*, eds. M. Schabacker, K. Gericke, N. Szélig, and S. Vajna (Berlin, Heidelberg: Springer Berlin Heidelberg), 61–72.

Eedy, D. J., and Wootton, R. (2001). Teledermatology: a review. *Br. J. Dermatol.* 144, 696–707. doi: 10.1046/j.1365-2133.2001.04124.x

Esterle, L., Mathieu-Fritz, A., and Espinoza, P. (2011). L'impact des consultations à distance sur les pratiques médicales. Vers un nouveau métier de médecin ? *Revue francaise des affaires sociales* 1, 63–79. doi: 10.3917/rfas.112.0063

Finnane, A., Dallest, K., Janda, M., and Soyer, H. P. (2017). Teledermatology for the diagnosis and management of skin cancer: a systematic review. *JAMA Dermatol.* 153, 319–327. doi: 10.1001/jamadermatol.2016.4361

Foucault, M. (1973). *Naissance de la clinique*. Paris: PUF.

Friedel, J., Dhers, M., Goujon, E., and Rondepierre, D. (2019). Devenir comparé des malades vus en téléconsultation sur un hôpital local et en téléexpertise en Région Bourgogne-Franche-Comté Sud, sur 1 an, de mars 2018 à février 2019. *Dermato. Mag.* 7, 271–279. doi: 10.1684/dm.2019.222

Gherardi, S. (2010). Telemedicine: a practice-based approach to technology. *Hum. Relat.* 63, 501–524. doi: 10.1177/0018726709339096

Glaser, B. G., and Strauss, A. L. (2009). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago: Aldine Transaction.

Goodwin, C. (1994). Professional vision. *Am. Anthropol.* 96, 606–633. doi: 10.1525/aa.1994.96.3.02a00100

Grosjean, M., and Lacoste, M. (1998). L'oral et l'écrit dans les communications de travail ou les illusions du "tout écrit." *Sociol. Travail* 40, 439–461. doi: 10.3406/sotra.1998.1315

Grosjean, S., Cherba, M., Nahon-Serfaty, I., Bonneville, L., and Waldolf, R. (2020). Quand la distance reconfigure la pratique clinique. Une analyse multimodale des interactions en télémédecine. Communiquer. *Revue de communication sociale et publique* 29, 61–87. doi: 10.4000/communiquer.5219

Hirsch, G., Drahy, F., Bernigaud, C., Hotz, C., Hua, C., Jannic, A., et al. (2018a). TELDERM Urgence: quels avis par téléexpertise? Étude transversale mai 2016 et mai 2017. *Annal. Dermatol. Vénéréol.* 145, S76. doi: 10.1016/j.annder.2018.09.056

Hirsch, G., Thomas, E., Fromentin, I., Haulon, S., Henry, O., Bouillanne, O., et al. (2018b). TELDERM: télé-expertise en dermatologie: évolution sur 21 mois dans un établissement gériatrique. *Annal. Dermatol. Vénéréol.* 145, S251. doi: 10.1016/j.annder.2018.09.388

Kivits, J., Balard, F., Fournier, C., and Winance, M. (2016). *Les recherches qualitatives en santé*. Malakoff: Armand Colin.

Lee, J. J., and English, J. C. (2018). Teledermatology: a review and update. *Am. J. Clin. Dermatol.* 19, 253–260. doi: 10.1007/s40257-017-0317-6

Liddy, C., Moroz, I., Mihan, A., Nawar, N., and Keely, E. (2019). A systematic review of asynchronous, provider-to-provider, electronic consultation services to improve access to specialty care available worldwide. *Telemed. e-Health* 25, 184–198. doi: 10.1089/tmj.2018.0005

Mathieu-Fritz, A. (2018). Teleconsultation in mental health. *Réseaux* 1, 123–164. doi: 10.3917/res.207.0123

Mathieu-Fritz, A. (2021). *Le praticien, le patient et les artefacts. Genèse des mondes de la télémédecine*. Paris: Presses des Mines.

Mathieu-Fritz, A., and Esterle, L. (2013). Changes in professional practices during medical teleconsultations. *Revue française de sociologie* 54, 303–329. doi: 10.3917/rfs.542.0303

Mathieu-Fritz, A., and Gaglio, G. (2018). In search of the sociotechnical configurations of telemedicine. *Réseaux* 1, 27–63. doi: 10.3917/res.207.0027

May, C., Gask, L., Atkinson, T., Ellis, N., Mair, F., and Esmail, A. (2001). Resisting and promoting new technologies in clinical practice: the case of telepsychiatry. *Soc. Sci. Med.* 52, 1889–1901. doi: 10.1016/S0277-9536(00)00305-1

McKoy, K., Halpern, S., and Mutyambizi, K. (2021). International teledermatology review. *Curr. Dermatol. Rep.* 10, 55–66. doi: 10.1007/s13671-021-00333-6

Miller, E. A. (2001). Telemedicine and doctor-patient communication: an analytical survey of the literature. *J. Telemed. Telecare* 7, 1–17. doi: 10.1258/1357633011936075

Miller, E. A. (2003). The technical and interpersonal aspects of telemedicine: effects on doctor-patient communication. *J. Telemed. Telecare* 9, 1–7. doi: 10.1258/135763303321159611

Miller, E. A. (2011). The continuing need to investigate the nature and content of teleconsultation communication using interaction analysis techniques. *J. Telemed. Telecare* 17, 55–64. doi: 10.1258/jtt.2010.100203

Mort, M., Finch, T., and May, C. (2007). Making and unmaking telepatients: identity and governance in new health technologies. *Sci. Technol. Hum. Values*. 34, 9–33. doi: 10.1177/0162243907311274

Mort, M., May, C. R., and Williams, T. (2003). Remote doctors and absent patients: acting at a distance in telemedicine? *Sci. Technol. Hum. Values* 28, 274–295. doi: 10.1177/0162243902250907

Neuse, W. H., Neumann, N. J., Lehmann, P., Jansen, T., and Plewig, G. (1996). The history of photography in dermatology. Milestones from the roots to the 20th century. *Arch. Dermatol.* 132, 1492–1498. doi: 10.1001/archderm.1996.03890360082014

Nicolini, D. (2006). The work to make telemedicine work: a social and articulative view. *Soc. Sci. Med.* 62, 2754–2767. doi: 10.1016/j.socscimed.2005.11.001

Nicolini, D. (2010). Medical innovation as a process of translation: a case from the field of telemedicine. *Br. J. Manag.* 21, 1011–1026. doi: 10.1111/j.1467-8551.2008.00627.x

Ohannessian, R., Yaghobian, S., Duong, T. A., Medeiros de Bustos, E., Le Douarin, Y.-M., Moulin, T., et al. (2020). France is the first country to reimburse tele-expertise at a national level to all medical doctors. *Telemed. e-Health* 27, 378–381. doi: 10.1089/tmj.2020.0083

Oudshoorn, N. (2008). Diagnosis at a distance: the invisible work of patients and healthcare professionals in cardiac telemonitoring technology. *Sociol. Health Illness* 30, 272–288. doi: 10.1111/j.1467-9566.2007.01032.x

Oudshoorn, N. (2009). Physical and digital proximity: emerging ways of health care in face-to-face and telemonitoring of heart-failure patients. *Sociol. Health Illness* 31, 390–405. doi: 10.1111/j.1467-9566.2008.01141.x

Oudshoorn, N. (2011). *Telecare Technologies and the Transformation of Healthcare*. London: Palgrave Macmillan.

Oudshoorn, N. (2012). How places matter: telecare technologies and the changing spatial dimensions of healthcare. *Soc. Stud. Sci.* 42, 121–142. doi: 10.1177/0306312711431817

Pappas, Y., Vseteckova, J., Mastellos, N., Greenfield, G., and Randhawa, G. (2019). Diagnosis and decision-making in telemedicine. *J. Patient Exp.* 6, 296–304. doi: 10.1177/2374373518803617

Perednia, D. A., and Brown, N. A. (1995). Teledermatology: one application of telemedicine. *Bull. Med. Libr. Assoc.* 83, 42–47.

Pols, J. (2012). *Care at a Distance: On the Closeness of Technology*. Amsterdam: Amsterdam University Press.

Ridard, E., December, H., Carvalho-Lallement, P., and Schuers, M. (2020). Indicateurs en télédermatologie: une revue de la littérature. *Annal. Dermatol. Vénéréol.* 147, 602–617. doi: 10.1016/j.annder.2020.01.024

Roberts, C., Mort, M., and Milligan, C. (2012). Calling for care: 'disembodied' work, teleoperators and older people living at home. *Sociology* 46, 490–506. doi: 10.1177/0038038511422551

Sicard, M., Pujade, R., Wallach, D., Escande, J.-P., and du patrimoine photographique, F. M. (1995). *A corps et à raison : photographies médicales 1840-1920*. Paris: Marval.

Sicotte, C., and Lehoux, P. (2005). "La télémédecine et la transformation des formes organisationnelles de l'hôpital," in *L'hôpital en restructuration: regards croisés sur la France et le Québec*, ed Nouvelle édition (Montréal, QC: Presses de l'Université de Montréal), 163–184.

Simon, P., and Moulin, T. (2022). Téléconsultation, télé-expertise, télésurveillance médicale: l'apport de ≪ Mon Espace Santé ≫. *Bull. l'Acad. Natl. Méd.* 206, 643–647. doi: 10.1016/j.banm.2022.03.008

Skayem, C., Cassius, C., Ben Kahla, M., Fiani, C., Frumholtz, L., Mra, M., et al. (2020). Alerte cutanée liée à la COVID 19: télédermatologie en remplacement des urgences dermatologiques? *Annal. Dermatol. Vénéréol.* 147, A203–A204. doi: 10.1016/j.annder.2020.09.249

Star, S. L. (1991). "The sociology of the invisible: the primacy of work in the writings of Anselm Strauss," in *Social Organization and Social Process: Essays in Honor of Anselm Strauss*, eds. D. Maines (Hawthorne, NY: Aldine de Gruyter), 265–283.

Star, S. L., and Strauss, A. (1999). Layers of silence, arenas of voice: the ecology of visible and invisible work. *Comp. Supp. Cooper. Work* 8, 9–30. doi: 10.1023/A:1008651105359

Strauss, A. L., and Corbin, J. M. (1998). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. New York, NY: SAGE.

Thonnelier, J., Khau, D., Mahe, E., Meckenstock, R., Monnier, S., Therby, A., et al. (2015). Apport de la télémédecine en médecine interne: expérience de la mise en place de la télédermatologie sur le centre hospitalier de Versailles. *La Revue de Médecine Interne* 36, A55–A56. doi: 10.1016/j.revmed.2015.03.291

Trupia, D. V., Mathieu-Fritz, A., and Duong, T. A. (2021). The sociological perspective of users' invisible work: a qualitative research framework for studying digital health innovations integration. *J. Med. Inter. Res.* 23, e25159. doi: 10.2196/25159