VISIBILIZING THE PATIENT'S BODY THROUGH ANTICIPATION
A MATTER OF CARE

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Abstract
Within the world of biomedical imaging and healthcare, imaging is standard routine practice, and seeing is believing (Saunders 2008). Philosophers of science theorized scientific and medical images focusing on how images inform and provide evidence (de Regt 2017; Perini 2005; Roskies 2007). Drawing upon critical medical humanities, care studies and visual STS, I argue that the patient's body is never simply *imaged* but it is *anticipated*. The process of anticipation, which attends to the *mise-en-place* of images and bodies, is key to understanding the care-bodies-imaging technologies ensemble. Furthermore, looking at the way care is approached through anticipation, I will make use of the concept of *visibilization* to show the performative character of the image-technology-body entanglement.
Keywords: Anticipating/Imaging, Care, Primal Scene, Biomedical Body Scan, Embodied Imagination.

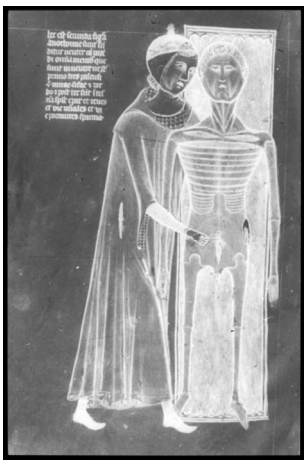

FIG. 1. Guido da Vigevano, Dissection of belly, Anathomia, 1345, Image from original ektachrome slide, Loren Carey MacKinney Collection on Medieval Medicine #3665, Southern Historical Collection, The Wilson Library, University of North Carolina at Chapel Hill.

INTRODUCTION

This article opens with an image coming from one of the oldest medical sciences, anatomy. The image shows an anatomist who has just put his scalpel into a dead body that is standing next to him. While cutting, the anatomist carefully holds his arm around the dead body to support it. The body of the anatomist occupies a three-dimensional space whereas the dead body appears like a cardboard figure. The author of this drawing was the physician and inventor Guido da Vigevano (1280-1349) who belonged to the first generation of anatomists practicing the art of opening the human body for dissection purposes. This image belongs to da Vigevano's textbook *Anathomia* (1345) which theorized and put at work for the first time (before the Renaissance) a close relationship between anatomical studies and artistic drawings.

When seeking to illustrate his anatomical descriptive notes, da Vigevano faced the problem of not being able to rely on any past pictorial tradition on how to depict the bodily interior. He was the first to depict the dissected body in a standing position. These illustrations, although schematic and rudimentary, would become a standard representation in later anatomical illustrations including those by Vesalius (1514-1564) developed for his monumental treatise *De Humani Corporis Fabrica* (*On the Fabric of the Human Body*).

In da Vigevano's drawing the dead body is depicted as nearly transparent: the bones of the chest, the muscles of the neck, the joint of arms, shoulders and legs are made visible to the naked eye although the interior of the body cannot be accessed without cutting it open. Therefore, the body made visible results from an act of imagination combined with the experience of the dissection. In antiquity, the body's internal structure was the subject of speculation, fantasy, and some study, but there were few efforts to represent it in pictures. Over the centuries, anatomy has gradually embraced the visual vocabulary of realism. Like other medical images, this one too has an epistemic power that is intimately connected with its performative function. The anatomist acquires knowledge of the anatomical body through the actions and gestures involved in the act of dissecting a corpse. This is not a neutral act. If one looks attentively, a detail can be noticed: the red incision in the dead body is mirrored in the anatomist's gown as if to underline that cutting into a body (producing a scar) leaves a scar on the anatomist too, on the subject performing the dissection. The im-

age makes visible the intra-corporeal exchange between the two bodies and, by doing so, becomes a performative image. The two bodies share a scare produced by the act of dissection and the process of making that act visible in the form of an image. The scar on the anatomist's gown does not have the same ontological status of the scar on the body of the subject of dissection. The first belongs to the realm of metaphors, the second to the realm of reality. Yet, the image produces, performs the intracorporeal relationship between the two bodies in the form of a double scar. The mediation between bodies, the image, and technology that this article discusses is an example of a relational ontology that not only prompts us to take relations seriously, but also to think about more-than-human relations.[1]

RECONFIGURING THE PRIMAL SCENE

Research in biomedicine and genetics after the Second World War was boosted by the advent of digital techniques of visualization and computer-assisted imaging technology (Löwy 2011). It inaugurated a new era in the investigation of the interiors of the body and brain, from the anatomic to the molecular body (Rose 2006; De Chadarevian, Harmke 1998; Leder 1992). Thanks to the computerization of medical observation, imaging has gained a primacy in medicine and healthcare that it never had before (Carusi *et al*. 2015; Smelik, Likke 2008). The seeming transparency of these new technologies functions both as an ideal to pursue and an ideology by which to navigate the anxieties related to our bodies in health and disease (Joyce 2008; Van Dijck 2005; Kevles 1998; Cartwright 1995).

As patients our bodies are scanned and transformed into data visualizations before, during or after the doctor-patient clinical encounter. These operations always occur through technological interfaces, both analogue and digital (Floridi 2011). Sensory work still plays a role in contemporary medicine and healthcare settings as scholarly literature (particularly in science and technology studies, and anthropology) demonstrates (Maslen 2016). Sensory work can occur in the form of either direct or technology-mediated auscultation/physical examination of the patient. However, as well as parsing and interpreting the clues coming from the patient's body, sensory work in medicine is increasingly mediated by technological interfaces.

In this changing environment, imaging is a central feature of diagnostic and treatment procedures, and of the patient experience. It is also a field in transition, tied to cycles of innovation in biomedicine and to a transformation of the relationship between the patient's body and the medical image. To be a patient is, increasingly, to become an image (Orton 2018, 6). We delegate the visibility of the body to an image which, in turn, becomes an operational interface supported by a matrix of algorithms. Non-invasive imaging procedures put the living body of the patient at the center of their investigation, but often in the guise of a medical image, with the actual body of the patient and the sensory work of the physician side-lined. The issue, as Maslen argues, is that «the sensory work of diagnosis is vital, to the extent that gaps in sensory information imply gaps in understanding» (2016: 160). Despite medical images being of crucial importance to an effective diagnosis, the multi-sensorial lived experience of the patient and the physician's sensory work of diagnosis and interpretation can neither be replaced nor adequately conveyed by a medical scan: these need to be accompanied by other non-visual and multi-sensory means of diagnosis and communication (Stahl 2018; Woods *et al*. 2016).

Medical scans of the body, namely, are not still photographs representing the subject: each body scan visible on a computer screen stands for a statistical dataset that derives its meaning from a changing database. If we start theorizing these medical scans as digital interfaces rather than as static images their performative function can be better understood. STS literature has since long moved away from the concept of the image as representation to the concept of «mediation» (Pasveer 2006), «enactment» (Woolgar, Lezaun 2013) and «visualization» (Burri, Dumit 2008). With her analysis on the performative character of images (Cappelletto 2013), Cappelletto pushes this debate even further revitalizing Belting's distinction between the «visual» and the «visible», and his idea that the «presence of an absence» is the most elementary definition of images in so far as images «perform an absence, which they make visible» (Belting 2005: 313).

Within the world of biomedical imaging and healthcare, scanning and imaging are standard routine practices, and seeing is believing (Saunders 2008). Cultural and social practices of visual representations and interpretations in medical imaging have been addressed by several scholars working in science and technology studies and medical anthropology (Beaulieu, Dumit, Joyce, Prasad, Roepstorff, Saunders

to name just a few). Philosophers of science contributed to a better theorization of scientific and medical images focusing, in particular, on questions such as how do images inform and provide evidence? How do images depict what they are about (Roskies 2007; Perini 2005)? Others, working at the crossroad of aesthetics and philosophy of technology, have shifted their focus from the technical image (Bredekamp *et al.* 2019) to the techno-sentient body-instrument ensemble (Montani 2019; 2020). Attention to the agency of image-data has been conducted by Eugeni using a media archaeological approach (2021); the tensions in the technology-mediated act of seeing have been tackled by Pinotti and Somaini (2016). As Cappelletto makes clear, however, the visual outputs should be studied not as iconic static objects, but rather as «visibilization processes», ways in which bodily organs are made visible (2022a; 2022b). It is, therefore, not their «to-be-looked-at-ness» (Mulvey 1975: 116) but the performative character of the image-technology-body ensemble that deserves further scholarly attention.

This article explores the crossroads of medical humanities, visual and cultural history of technology, and care work studies. It calls for attention to the «techno-sentient body-instrument ensemble» (Montani 2019; 2020) to investigate the relationship between biomedical imaging technologies, their visual output, the body, and matters of care as I explain in detail in the next paragraphs. Drawing upon literature from the critical medical humanities (Woods 2023), visual science and technologies studies (Galison 2014), and care studies (De la Bellacasa 2007; Mol *et al.* 2010), one sees how the contemporary medical image is one of the configurations of the doctor-patient clinical encounter. Traditionally, the medical humanities have focused their attention on the understanding and representation of the «primal scene», defined as the encounter between the patient who experiences illness, diagnosis, and treatment (the term «patient» is here used to describe the position of the person), and the doctor[2]. The first wave of the medical humanities, namely, has been dominated by philosophical, historical, and social approaches, investigating the «primal scene» at the moment of diagnosis (Whitehead *et al.* 2014: 2). In the last decade scholars have attempted to move the focus and scale of attention in order to capture the nuances of the contemporary doctor-patient encounter and the multiplicity of networks and nodes that characterize the fields of medicine and health (Whitehead *et al.* 2016; Chiapperino, Boniolo 2014; Brody 2011; Atkison *et al.* 2010). The idea behind this shift in

scholarly attention is to find ways of expanding the boundaries and contexts of care to include the cluster of actions and gestures that attend to the visibilization of bodies that this special number explores (Kristeva *et al*. 2018; Crawford *et al*. 2015).

This article avoids conflating care with cure. Moreover, it does not move from a conceptualization of care to an intervention on matters of healthcare. Care is therefore not simply a matter of «taking care» of the actual patient. Rather, care grows out of the reiterated and collaborative attempts to attune both knowledge and technologies to the body of the patient outside and even before such body materializes. This could be the case in the early stages of the development of a medical technology or during the procedure of turning data into an image of quality, namely an image responding to functional and stylistic criteria that can make it suitable for diagnostic purposes, and is obtained following the most appropriate procedures and based on trustworthy datasets. Care cannot be circumscribed to doctoring or nursing, but it is a relational practice that nurtures intra-bodies exchanges happening between bodies, technologies, and images outside and before the doctor-patient encounter. More conceptual work on care is needed given that, although care is at the center of medical practice and policy interventions, it remains curiously under-theorized beyond the primal scene of the clinical encounter. In view of contributing to such theorization, I suggest that a sustained critical engagement with the body-image-technology ensemble *before* the doctor-patient encounter, for example in the early stages of an imaging technology development (what I define with the concept of «anticipation»), can respond effectively to Viney, Callard and Woods' call for a «widening of the sites and scales of 'the medical' beyond the primal scene of the clinical encounter» (2015, 2).

What does the primal scene become when the doctor-patient encounter is mediated through technology-based data-visualization? What if one were to dislodge the medical humanities' «primal scene» and replace it not with another scene but with those gestures, actions and materials designed to *anticipate* rather than to image the body of the patient before any actual encounter? The actions clustered under the locution «anticipating the patient», which I shall define in what follows, influence and shape the quality of the image acting as an interface between clinician and patient. An image of quality is readable by radiologists and enables physicians to carry out a diagnosis. Qual-

ity is not simply related to the absence of artefacts and noise, but also to the dimension of care. Care begins well before an image of quality is created, that is in the stage of development of biomedical imaging technology before the data-visualization pipeline becomes standardized. This move is possible by means of loosening up the temporality and spatiality of the doctor-patient encounter to the variety of *loci* and entanglements between humans and technology that are performed *outside* and *before* the clinical encounter.

To explore this issue, I explain what it is understood by «image» when talking about medical images, and then I introduce the concept of «anticipating» the patient's body (in contrast to simply «imaging» the body). This concept better grasps the medical image as a reconfiguration of the primal scene. There are many instances in which this anticipation is possible. I shall posit that the patient's body is never simply *imaged/visualized* in the final medical image, but it is rather *anticipated* in the actions and gestures of those who take care of a technology in the early stages of its development. These actions and gestures become visible by conducting an empirical study, that is by means of a close reading of visual material depicting those early stages, together with the analysis of accounts of the professionals involved in the form of academic papers and qualitative interviews. I have explored elsewhere instances of anticipating the body through an in-depth study I undertook on the bodily, situated aspects of data-visualization work and practices around the development of Magnetic Resonance Imaging (MRI), one of the key biomedical imaging technologies used for both research and clinical purposes (Casini 2021). Here I limit my analysis to theoretical reflections that might be tested and challenged, empirically, in future studies. The theoretical approach used in this article is grounded in the concept of care practice as a matter of tinkering (Mol 2002) and of embodied imagination; more generally, the article adopts Verbeek's idea of the relationship between technologies and humans as characterized by mediation (Verbeek 2011). The expansion of care from the clinical encounter to the early stages of a biomedical imaging technology development responds to Puig de la Bellacasa's call for expanding and mobilizing the configurations and sites of care beyond the more traditional venues and roles assigned to it (De la Bellacasa 2009). Distributing care across a network of humans and technologies means inscribing care into the materiality of these circuits instead of side-lining care to the doctor-patient encounter.

MEDICAL IMAGES: ONTOLOGIES, EPISTEMIC POWER, AND USE

It is hard, namely, to define medical images as they cannot be reduced to any specific technology (engraving, X-rays, photography, computer-assisted tools), to genres, to practices (taking photographs, programming), to specific instruments (pencil, imaging technology), to symbolic forms (perspective), to a social function (diagnosis, education, communication). One can say that medical images differ from scientific ones in so far as they tend to focus on abnormality/normality, healthiness/pathology, often merging the visual vocabulary of scientific realism with aesthetic values and conventions. Medical images have to do with the empirical investigation of phenomena including the human body either at the molar level (the body as a self-contained organic whole made of muscles, tissues, organs) or at the molecular one (the body as a fragmented assemblage made up of cells, molecules whose functioning depends much more on interactions with the surrounding environment)[3]. Medical images have an epistemic value that depends on the medium, the technologies/techniques they are made of, and they are performative in the sense they do things in the world.

Even a cursory overview of the history of medical images highlights their variability and the difficulty of defining what a medical image is. Perhaps this difficulty is motivated by the fact that images *tout court* resist any semiotic reading. In more general terms, the ability to translate phenomena into images is an interpretative intervention. Images never simply illustrate, therefore, but they fuse the visualization of an object with the history of their own application. However mechanical and detached from an individual's intentions and mindset, images are always instances of a period, a style, research, a technique. This is hardly surprising considered that, after all, if vision denotes all the anatomical, physical, and geometric aspects concerned with the act of seeing, visuality, on the contrary, is the bundle of social factors involved in the act of seeing (Haraway 1991).

Some further terminological clarification is necessary to address medical images. When dealing with medical images one talks about *image-data* to highlight the quantitative, digital aspect of medical images, their different epistemic value. An example is provided by scans of the body obtained with biomedical imaging techniques. The epistemic value of photographs is based on, first, the causal dependence on the

object (the photograph and the depicted object share features, and the properties of the object cause certain features of the photograph). Second, the epistemic value of photography is based on transparency (looking at a photograph is like looking at the scene/object photographed) and, finally, belief independence (the photographer certainly makes choices, but many properties of the photograph are independent from the maker) (Roskies 2007).

Things are much more complicated when dealing with biomedical scans as they are far from being photographic snapshots. Body scans are rather data visualization resulting from complex processes, statistical averages carried out by several professionals (physicists, computer scientists) using a variety of techniques. With this type of image-data we are in the realm of what Daston and Galison call «trained judgement», a type of objectivity based on the scientific attitude of the expert who is able to interpret the data of mechanical objectivity in a way that identities meaningful patterns and family resemblances in what can be observed, mechanically, but not understood by the machine (Daston, Galison 2010). This is why one more often encounters the terms visualisation and/or imaging in lieu of the term image. Visualisation is any human-made visual pattern (a diagram, for example) that renders an object or a fact perceptible to the human eye. Visualization can also occur with instruments used as aids for vision (the microscope would be an example). Imaging is similar but it is often used in the medical context more specifically to describe particular procedures and equipment and the problems involved in their application (this is the case, for example, of brain *imaging*). The term has become primarily associated with digital media. In the call for this special number, Cappelletto and Galimberti offer an important contribution to a further conceptual clarification of the term visualization and its relation to both the body and the technological apparatus, in a manner that spouses the relational ontology of certain STS scholarly work with the tools of philosophy. As Cappelletto argues, the body made visible, the body turned into an image can be better defined as the *body visibilized*, the notion of which is apt for grasping what is at stake when we study and make use of medical images. For, «the *visibilized* body» is not simply the *visualized* body, being rather «the product of the intracorporeal relations among data, gestures, and actions of pragmatic nature that go beyond sight and the visual»[4].

The concept of the body visibilized is apt for grasping what is at stake when we study and make use of medical images.

ANTICIPATING *VERSUS* IMAGING THE PATIENT'S BODY

Etymologically, the word anticipation comes from the Latin verb *anticipare* «take (care of) ahead of time», literally «take into possession beforehand». Later in c. 1600 the word took on the meaning of «becoming aware of something coming at a future time» in the sense of forestalling, looking forward – that is, expecting something that is going to happen with a feeling of excitement. The phenomenological understanding of the concept of anticipation makes it an essential feature of any human action: «In every action we know the goal in advance in the form of an anticipation that is "empty", in the sense of vague... and [we] seek by our action to bring it step by step to concrete realization» (Schutz 1997: 58). Anticipation is thus a form both of an active «taking care» and a giving birth.

In the early stages of research and development of a new biomedical imaging technology attention is mainly given to the correct functioning of the technological apparatus, to writing the algorithms required to turn data into images, and to solidifying the data-visualization pipeline protocol. Although the patient does not arrive until later in the process, it is in these very early stages that the body of the patient can be anticipated in multiple ways, each one with a different grade and nuance of embodiment. First, scientists can anticipate the patient by means of using their own body. Following an established tradition within physics, scientists act as experimental subjects, as guinea pigs, for the testing of a newly developed technology. This way of anticipating the body of the patient forces scientists to exercise an act of embodied imagination, acting as if their bodies were the patients' bodies, thus taking up the role of end users.

Second, scientists anticipate parts of the patient's body by means of imaging phantoms–dummy objects used to calibrate medical imaging equipment. Here the process is not of embodied imagination but of a replacement of the body. Phantoms are used in lieu of the patients' bodily parts when the prototype of an imaging technology needs to be tested before clinical trials can commence. Phantoms can be any type

of three-dimensional models that are filled with water, as the human body is. The term has been adopted in the medical world to mean any test object that mimics the human body in some way, although phantoms have uniform and stable features whilst human bodies present little homogeneity. Very much like other three-dimensional models in science, phantoms belong to a network of production, interpretation, and communication. Phantoms are crucial for the data-visualization pipeline in a biomedical imaging scanner as they are used to produce images that can act as proofs-of-concept that the machine is working properly, that the signal is clear and that images of quality (that is, images capable of bearing information useful for clinicians and radiologists) can be produced once clinical trials start.

Third, physicists sometimes anticipate the body of the patient through modelling either analogue or digital modelling. Physicists' notes, sketches and digital modelling can relate to the design of technological components that are connected to the patient's body – for example, in the case of biomedical imaging scanners development, it can be the design of the coils which are key components of biomedical imaging scanners and act as the interface between the physicists and the body of the patient inside the scanner. One can reconfigure the primal scene through the category and cluster of actions that I gather below under the concept of «anticipating» the patient's body. This conceptual move can be the conduit for grounding the concept and practice of care into biomedical imaging technology development at a scale that exceeds both the human and the traditional doctor-patient encounter. Although this grounding does not have a straightforward impact on *cure*, it proves key to a better grasp of the entanglement between technology and *care*. The act of anticipating the patient means arranging the material conditions that enable care-work rather than preparing oneself (or another) to care for the patient.

Craftsmanship and tinkering work with a technology under development have aspects in common with care work as it is described by Annamarie Mol. Namely, not only is care inexorably tied in with technology, but technology has also to do with care both in the sense that technology informs care and in the sense that the objective of care informs the creation of a certain type of technology (Mol *et al.* 2010: 14-15). As delineated above, I posit a distinction between «imaging» the patient and «anticipating» the patient. One needs, first, to conceptualize the action of «anticipating the patient» already at work

during the early stages of a new imaging technology development and, second, to single this practice out from the act of «imaging/visualizing the patient» in order to respond effectively the call by Viney, Woods and Callard for re-adjusting the parameters of the «medical». The «medical» begins earlier on, with the conceptual and practical actions involved in designing, building, tuning in, and trialing new biomedical imaging technology.

Physicists/physicians carry out this act either with their own bodies, with an object in lieu of the patient's body, or with embodied imaging that is an act of imagination grounded in the possibilities and constraints provided by the given body and its environment (Rucinska, Gallagher 2021). The act of embodied imagination can occur via paper (drawings, design sketches) or via other media, and can be accompanied (or not) by the use of one's own perceptual motor system.

Whose body and what kind of body is anticipated in the early stages of development of an imaging technology? It seems that there is one body involved in the act of anticipation, albeit one that plays a double role: it is the physicist's own body used to test the apparatus and it is the same body acting *as if* it were the patient's body. In the interplay between imaging and anticipating the body, what is at stake is the «body multiple» that Mol describes as «the body, the patient, the disease, the doctor, the technician, the technology: all of these are more than one. […] No body is singular because it attends to the multiplicity of reality that sustains it» (2002: 5).

To conceptualize further the distinction between the imaged body and the anticipated body, the difference between the molar and the molecular body needs to be recalled. Biomedical technologies are routinely used to image either the entire body of the patient or parts of it. The body is a biocultural ensemble often «fragmented» into smaller units such as organs, tissues, molecules, atoms. The body *anticipated* is different from the body *imaged*. It is the molecular body that is imaged. The gaze of biomedical imaging technologies is algorithmic and organized around the sampling of data coming from the interactions between molecules, and the calibration of parameters. In a biomedical imaging examination, typically, the patient's body is sliced (digitally), sampled, its parameters are measured, evaluated, collected, quantified. Then the body is re-assembled digitally as data stored in the k-space matrix from which an image will be obtained thanks to mathematical algorithms. It is, then, the whole molar body of the patient (the cor-

poreal body) that is anticipated rather than this digital one arranged in slices before commencing the examination. The idea of anticipating the body by means of using one's own body to test the technological apparatus was and still is a common trait of research groups involved in the development of biomedical imaging technologies across the world. Before gaining approval for clinical trials, acting as an experimental subject was and still is the only way to test a new biomedical imaging apparatus and make the necessary adjustments.

Other medical imaging technologies can be mentioned here to theorize and compare how the patient's body is anticipated. One example is medical obstetrics ultrasound, a diagnostic technology crucial to women's lives, developed in Glasgow between the 1950s and the 1960s. The rich archival resources related to the development of medical obstetric ultrasound emphasize it as a cross-disciplinary endeavor with contributions from experts in obstetrics, industrial design, engineering and electronics. After researching the Glasgow School of Art's Archives and Collections and undertaking oral-history interviews, scholars were able to highlight the role played by the designer Dugald Cameron who «transformed a brilliant in- novation but a clumsy piece of technical apparatus into an elegant, usable product design and, in so doing, helped revolutionize the clinical management of antenatal treatment and care in Glasgow and beyond» (Macdonald 2019: 2).

The ability to anticipate the future patient's body through an act of embodied imagination can be foregrounded by looking at Cameron's drawings of the ultrasound machine which depict another way of imaging the relationship between the technical apparatus, its operator and the patient's body. The drawings of the designer-engineer Cameron evinced the degree of attention paid to the relation between human and machinic components, between the machine operator and the perception of the end user of the technology (the woman with her own body) (Robertson 2019). In Cameron's own words:

> That was my attempt to give a three-dimensional view of what that machine was going to look like. On the left [of the drawing] are the two sketches where what we thought we ought to do was to separate out the patient, the doctor, and the machine and try and put these three things in a better ergonomic relationship with one another, so that the doctor would actually be on a level with the patient and seated […this had…] a central stem with things growing out of it, including a desk for the operator, doctor typically, and a place for them to keep all their bits and pieces. And be level with the patient, so not looking down on the patient (Macdonald 2019: 10-12).

The drawings are ways of exploring conceptually and materially the relationship between the machine, the operator, and the patient. Furthermore, the re-configuration of the human/non-human elements of this relationship constitute, not only a way of anticipating via an image (the drawings) the doctor-patient-technology relationship but, also, as Cameron intended, a way of making this relationship more equal and less patronizing. The anticipating gesture can be interpreted as an act of care toward the patient before the patient materializes for undergoing the medical ultrasound. The designer-engineer Cameron was able to visualize (and, hence, anticipate) the body of the patient on paper before the actual completion of the technology. Ergonomic values enhance both the machine operator and the patient's experience and are explicitly foregrounded from the beginning. Imaging, designing, planning, and then creating a new piece of technological equipment is, therefore, a matter of mediating between technology and the human beings who will use it: «the design of technologies [is] a highly responsible activity. Designing technology is designing humanity, in a sense. Any technology will help to shape human actions and experiences and will therefore have an impact that can be understood in ethical terms» (Verbeek 2015: 28). Humans and technologies mutually shape one another, and the design of a scanner bears with it the conceptualization and design of the machine-patient-doctor system.

The anticipation of the patient is, then, a form of intelligent ability laid on practical effectiveness and involving multiple skills. The Greeks distinguished episteme (knowledge), techne (universal technical knowledge) and *mêtis* (experiential, local knowledge, and skillful intuitive perception). Technical knowledge is based on logical propositions, rules and principles and may have no practical output. It can be organized into small steps that can be verified and taught. *Mêtis* is concerned with personal skill, or «touch», and achieving practical results. As the historians/anthropologists Detienne and Vernant describe it, *mêtis* is «impulsive, swift, but in no way does it act lightly. […] Instead of floating hither and thither, at the whim of circumstance, it anchors the mind securely in the project which it has devised in advance thanks to its ability to look beyond the immediate present and foresee a more or less wide slice of the future» (1991: 8).

This definition makes clear that without *mêtis* no anticipating gestures are possible. The anticipation of the patient, namely, entails the ability to act in order to *prepare for something that one thinks will*

happen. Embodied imagination is both a highly speculative form of thinking and a form of *mêtis*. In the 1970s, the years when biomedical imaging technologies such as MRI and PET scanners were under construction in different research groups across the world, philosopher Jerome Ravetz was suggesting craft skills and artisanal knowledge as drivers of science (Ravetz 1995). Imagination occurs in the guise of «as if and what if scenario-building», through which scientists envisage possible situations in which the patient's body encounters the new imaging technology. The as if scenario occurring during the anticipating gestures should be understood by no means as a fictional one, but rather as a *mise-en-place* of the body (still absent) before the actual imaging procedure can be carried out on the live body of the patient. The cluster of gestures and actions I gathered under the concept of «anticipating the patient» are the conditions enabling the visibilization of the body which is never limited to the machine-driven process of obtaining a bodily scan. Rather, it is built up within the entanglements of images, bodies and technologies during the whole «medical» process. To put it plainly, the very process of visibilization encompasses both the imaged body and the anticipated one. The observer, the observed and the observing instrument cannot be articulated in the absence of any of the others and throughout all already mentioned phases. Thus, in this relational ontology model measuring devices, phenomena, and things co-constitute one another. To focus on visibilization is to show the performative aspect of this multifaceted ensemble. Objects, bodies, and phenomena are demonstrably instantiated in and by material practices, produced performatively in concrete situations and thus – crucially – can anchor actions related to care.

These actions and gestures I clustered under the concept of «anticipation» can open a different conceptualization of care at a scale ignored by the primal scene in the medical humanities for which care happens exclusively during the doctor-patient encounter. Engaging with care in medicine is a practice that combines humans and technologies in a manner that is distinct from the twentieth century idea that, as Mol argues, «care was other to technology. […] Care was a gift, technology made interventions» (2010: 14). Care does not always necessitate words for it entails gestures or operations carried out by non-human agents (for example, a machine can be programmed to assist the patient's vital functions). Care is carried out through technologies whose functioning is not always smooth and frictionless; therefore,

care is an act exercised while tinkering with, fixing, and building technologies or technological components (Law, Singleton 2000).

The manual labor involved in the creation of each component of a new medical machine, is not simply a way of taking care of the technological object, but much more significantly, a way of taking care of patients, who are the end users of this technology. Even in the act of anticipating the body of the patient, the body cannot eschew the same normalization and standardization that occurs during the imaging stage with the digital slicing of the body. The patient's body that scientists anticipate is the «average» body; yet, it is the unique body of an individual patient that is encountered once clinical trials start.

Following de la Bellacasa, care is a «force distributed across a multiplicity of agencies and materials» (2017: 20). Touch is an increasingly lost dimension in the image-mediated doctor-patient relationship. Anticipating the patient means to bring touch back into the picture, albeit via an indirect touch, a touching that never touches the patient's body but rather touches the machine that will welcome the patient's body. There is a circularity of care through touch, analogue to the chiasmatic structure that phenomenologist Maurice Merleau-Ponty assigns to the lived body: the concrete gesture of caring for a technology that will be used for taking care of the body (Merleau-Ponty 1968). Bearing upon De la Bellacasa's definition, care is, then, a force engaging not only with objects, technologies, humans or physical forces that are present *here and now*. Anticipating the patient opens the dimension of care to the horizon of potentiality, of a future tense (taking care of a patient's body not yet present). It is a notion of care-at-a-distance. The fact that the body is anticipated before being imaged with biomedical imaging technology means that the body comes neither after the technology nor before it. The body co-exists, it is not a determinate entity before or after technology, but it is shaped by the technology itself and vice versa.

CONCLUSIONS

Medical images are often treated as a window onto a pre-existing body that precedes the image, whereas bodies are constituted both *before* and *through* images. In today's biomedicine, the primal scene is not simply that of the physical clinical encounter; it is the encounter

between clinicians and the patient's set of biomedical images, as in the so-called multi-disciplinary team (MDT) meetings in which professionals from different clinical disciplines (oncology, radiology, and so forth) discuss images of each listed patient to reach a consensus on the recommended treatment. The image itself is a series of numbers (image-data), a way of measuring bodily parameters. Yet, images are deeply connected to the patient's body. On the one hand, biomedical imaging procedures put the body of the patient at the center of their investigations, but often in the guise of image-data with the actual body of the patient remaining absent. On the other hand, as mediating interfaces between the doctor and the patient, they cannot be simply dismissed as reductive of the complexity of the patient's body and of nuanced lived experience.

An image of quality is often the first care-production site before the actual clinical encounter takes place. Ultimately, the article posits that an image of quality can only be created if the body of the patient is *anticipated* before it is *imaged*. The various configurations that the process of anticipating the patient can take, a process occurring before clinical images are created, there is space for care work. During the imaging phase in a scan procedure carried out with biomedical imaging technologies, the imaging process itself is black-boxed and carried out almost entirely by the machinery: care work is present, but it takes the form we are usually familiar with – that is catering for the patients' needs, for example, taking care of the patient's comfort during the imaging examination. The body, with all its intimidating materiality, health conditions, physical constraints, and needs – in a word, its aliveness – is a dauting presence. Very much like in the anatomical image I discussed in the opening paragraphs of this article, the act of imaging the body is not a neutral act as it does leave a trace onto those who perform such procedure, regardless of whether the procedure is invasive (cutting open the body to access its interior) or not (using biomedical imaging technologies). Care and the process of anticipation are part of the same cluster of actions that attend to the *mise-en-place* of images beyond any simplistic understanding of images as belonging to the realm of vision and visuality and of bodies as simply «visualized» rather than «visibilized». To visibilize then means to focus on the co-constitutive relations among data, images, bodies, and technologies, by appreciating their performative interactions.

All in all, being able to anticipate the body before clinical trials or before the act of diagnostic scan can help to emancipate these medical images from their strictly diagnostic essence to insert them into a wider network of bodies, technologies, and acts of care. This is key to an expanded and encompassing understanding of the entanglement among care, bodies, and imaging technologies.

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ENDNOTES

[1] Examples of relational ontologies abound both in STS and in STS-influenced philosophical work. See the Actor-Network Theory in Latour and then in Mol (Latour 1987; Mol 2010); the concept of milieu in Simondon (1989); the ecology of practices in Stengers (2005); the concept of entanglement in Barad (2007) and the ontology as ecology in Morton (2010).

[2] In the article I make use of the terms doctor and physician as synonyms (e term doctor tends to appear in the medical humanities literature I have consulted, and I adopt this convention. Clinician, on the other hand, is used to refer to a healthcare provider working in a clinic or hospital.

[3] For the distinction between the molar and the molecular body see Rose (2006).

[4] C. Cappelletto, Personal Communication to Author, 16 September 2023. On the concept of the visibilized body, see Cappelletto (2022a).

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