3

Reclaiming the cyborg

Introduction

Previously in Chapter 2, research findings from those who took part in the survey and focus groups demonstrated that if people were made to choose between human, animal and mechanical materials as possible medical therapies, there was a clear preference expressed for regenerated or transplanted human options, followed by implantable medical devices, which were in turn preferred over xenotransplantation.

By drawing on Sanner's (2001a) theory of contamination, mechanical implants do not have the same properties of contamination from the other (once) living beings, as I concluded in the previous chapter. Implanting devices avoids the subjectivity alterations that organic parts may cause the recipient. Mechanical parts have no association with the once living and are not contaminated by them, and cannot in turn, therefore, contaminate the recipient. Whereas organ transplants can cause episodes of rejection, implantable devices are associated with malfunction and infection. In this chapter and the following Chapter 4, I take a closer look at the issues that inserting machines into the body can cause their recipients.

Implanted medical devices are relied upon by medical professionals and patients alike, offering the possibilities of an increase in the length and quality of lives. While a broad understanding of the term 'implantable' might include those technologies that are consumed (e.g. pharmaceuticals), such products are not intended to be permanently incorporated as an active medical device which is placed inside the body. An active medical device is an instrument, which, with its software, can be used for

diagnostic and therapeutic purposes, relying on a power source other than that generated by the body. The Active Implantable Medical Devices Directive (1993) (AIMD 90/385/EEC as amended by 2007/47/EC) defines an active medical implant as:

any active medical device which is intended to be totally or partially introduced, surgically or medically, in to the human body or by medical intervention in to a natural orifice and which is intended to remain after the procedure.

Implantable medical technologies that augment and replace human organs have become smaller, cheaper and even ‘smarter’ in the last 40 years or so. Implantable medical technologies such as CIs and glucose monitors, cardiac devices such as ventricular assist devices, pacemakers or ICDs and DBSs are examples of medical technologies that are becoming increasingly ‘smart’ (Haddow, Harmon and Gilman, 2016). As colleagues and I have noted elsewhere, these devices are smart because they are capable of being responsive to changes within the body they were implanted in without human intervention (Harmon, Haddow and Gilman, 2015). Such medical implants are more sensitive, responsive and autonomous in their functionality when compared to the static and stationary hip or knee joints, artificial skin and implanted corneas.

ICDs and life with a heart device

The human heart can be viewed as a pump or engine in the Cartesian body-as-machine and can be bypassed, stented, transplanted, beta-blocked, ablated, paced and replaced and, importantly, defibrillated by implantable cardiac devices (ICDs). ICDs are one of the increasingly ‘intelligent’ implanted technologies playing an accepted ‘normalised role’ in peoples’ lives, that is, as colleagues and I have suggested elsewhere they are on the path to becoming mundane, everyday and ubiquitous (Harmon, Haddow and Gilman, 2015, Haddow, Harmon and Gilman, 2016). We have argued that implantable technologies are ‘smart’:

Indeed, our lives are increasingly enacted within an intricate web of increasingly ‘smart’ technologies, which are not just performing *for*

us, but also *on* us and *within* us. By 'smart', we mean they exhibit one or more of computational intelligence, autonomous operation and responsiveness to environmental changes (i.e. they monitor, transmit, and potentially initiate a treatment action).

(2015: 231)

ICDs demonstrate more than one of the categories we proposed of autonomy, intelligence and responsiveness. Autonomy includes Wiener's classic definition of 'cybernetics', from the Greek word 'kybernutos' meaning 'governor' of a system (Wiener, 1961). ICDs also have features of an autonomous feedback mechanism operating as a closed-loop system, elements that, I go on to show, are stressed by Clynes and Kline in their original definition of cybernetic (Clynes and Kline, 1960). I choose, however, to refer to cybernetic as Haraway's C3I (command-control-communication-intelligence), which she argues is the essential criteria for modern war (1991: 150), and I argue the C3I definitions cover the requirements needed to define an implant as cybernetic.

I will suggest that an ICD is not only smart but might be considered a cybernetic device and is therefore quite literally putting the 'cybernetic' into 'organism' and creating a cyborg. Other cyborg scholars have given the term cyborg further academic and empirical refinement (Gray, 1995a, Pollock, 2011, Oudshoorn, 2015, Oudshoorn, 2016). Scholars in Science and Technology Studies (STS) and Body Studies acknowledge the experiential basis of cyborgisation and examine how the 'cyborg' condition is created as an empirical entity (Bjorn and Markussen, 2013, Oudshoorn, 2015). Different kinds of cyborgisation created through the implantation of modern biomedical technologies, such as the implantable cardiac defibrillator (ICD), as well as cardiac pacemakers (CP), cochlear implants (CI), deep brain stimulators (DBS) and *in vivo* biosensors (IVB) have different functions, features and therefore different consequences for the individual they are implanted within. I turn now to begin a discussion of these points with a brief outline of the modern history of the cyborg and how he (and I mean 'he') started as a hypothetical future space-man, eventually transforming into a science-fiction nightmare, to then be adopted as a feminist liberation concept from dualistic binary categorisation challenges (Haraway, 1991). In doing so, I introduce features of implantable technologies that might lead them to be

considered smart and/or cybernetic, arguing that the latter eclipses all the features of the former. I compare the everyday cyborgs, to alternative versions of the cyborg (the space-man, the science-fiction monster and cyborg-as-liberator (Haddow et al., 2015)), ending with a discussion of the vulnerabilities caused by creating a techno-organic hybrid both in terms of alienation and a lack of human agency. First, however, I establish why I advocate for the use of the term ‘everyday cyborg’.

Why everyday?

Adding the word ‘everyday’ as a prefix to the term ‘cyborg’ is important for a variety of reasons. First, the term ‘cyborg’ is hardly ever used in medical or health circles, despite both the acceptance and reliance on implantable medical technologies such as ICDs that can be considered as cybernetic. This may be due to the typical portrayal of the cyborg as monsters in film and literature, and therefore the first reason for the addition of the prefix ‘everyday’ signals that the ‘everyday cyborg’ is very different to the literature or film monster version that inhabits nightmares and I will discuss further below.

Second, there is a greater variety of implantable medical devices that have smart or cybernetic functionalities that are increasingly being relied upon on a day-by-day basis by clinicians and health professionals to save and improve the lives of individuals. The inclusion of the prefix ‘everyday’ is broad enough to capture the diversity of experiences from different cyborgisation processes. Reviewing research with those who have different types of smart technologies, I explore whether it can be considered ‘smart’ (autonomy, intelligence and responsive) as well as having features that overlap with ‘cybernetic’ and fulfill the C3I (Haraway, 1991).

As I will show, everyday cyborgs implanted with an ICD have additional concerns when compared to other cardiac patients relating to the vulnerabilities that are created by living life with a heart device. The ICD cybernetic system has an intimacy due to its being inside the body; an intimacy with the body that simultaneously makes it beyond the reach and control of the individual it functions within. Ironically, although the ICD might be physically

out of reach of the everyday cyborg, recent policy and newspaper reports suggest that the communicative aspect of the cybernetic device makes it within reach of hackers, vulnerable to hacking by others (either through accessing data about the physiological processes or changing the device's cybernetic functions to harm the everyday cyborg).

Third and relatedly, I use the adjective 'everyday' to describe the 'new normal' or 'the new different' of living as a medically created cyborg, which, as I will show, is an achievement that cannot be taken for granted and requires acclimatisation to (Das, 2010). 'Everyday cyborgs' point to the new vulnerabilities for individuals who are created through the process of cyborgisation itself, and I will devote discussion of this moving forward. Fourth, emphasising the everyday answers the plea by medical sociologists to examine less attractive technoscience options that involve the 'subtle restructuring of identities':

As to the medical technologies that await our investigation, we would like to repeat our plea for the seemingly mundane, 'infrastructural' technologies ... that do not have the immediate attraction of reproductive-technologies, HIV-AIDS, or genetics. It is often in the seemingly 'technical' matters that deeply relevant, social issues are 'hidden' – such as inclusion/exclusions of certain groups or voices, of the subtle restructuring of patients' or professionals' identities.

(Timmermans and Berg, 2003: 108)

'Mundane' and 'hidden' is important for discussions about the creation of everyday cyborgs, not least because the implants are literally hidden inside the body, but because much of what is discussed in popular culture, academic discourse and policy circles about cyborgs (Nuffield Council on Bioethics, 2013) do not focus on what a routine day is like for some, and fewer review the 'technological mediatedness of human subjectivity' (Schraube, 2009). So, fifth, by reclaiming the cyborg for the everyday, social issues that are previously 'hidden' can be made visible.

The everyday cyborgs, I will argue, are created within social structures that create and maintain discriminatory practices; creating cyborgs therefore reifies and does not challenge existing inequalities in a cyborg society. I will outline how feminist science and technology scholar Donna Haraway described the cyborg as a 'cybernetic organism, a hybrid of machine and organism, a creature

of social reality as well as a creature of fiction' (1991: 119) to liberate individuals from the structures that constrain them; structures that we created. Taking the lead from Haraway (1991) who uses the cyborg as a means by which boundaries between non-human animals and humans, the physical and the non-physical and animal-human/machines can be dissolved, she argues for a need to focus upon the way relations are socially structured and historically constituted rather than solely on the technology itself (1991: 165). Then Haraway deploys the cyborg as a positive feminist metaphor as highlighting and simultaneously invalidating dualistic modes of thought.

Finally, the last reason to use the term 'everyday cyborg' is that it opens up a discussion of the gendering of the everyday cyborg showing that the practice of cyborgisation in operating theatres and hospitals reflects the male dominance found in science or horror fiction about cyborgs as well as life. Hence, the value of appropriating the term everyday cyborg encompasses the social stratification of cyborgisation, which benefits one sub-section of the population over another and it is, therefore, a necessary terminology to identify and reveal these hidden discriminatory practices. Cyborgisation is inevitable and is due in large part to the ever-increasing need to repair the human body with an ever-increasing array of technoscientific solutions in the form of implantable medical devices.

From outer space to an inside place

While speculating upon the future needs of individuals to survive space travel, the term 'cyborg' was first introduced by researchers Clynes and Kline, in their 1960s article 'Cyborgs and Space'. Their implantable auto-biotechnologies included osmotic pumps to deliver drugs, and electrical stimulation of both the heart and brain would be required as well as standard homeostatic systems relating to pH balance, nutrition, and glucose levels. As they stated, '[F]or the exogenously extended organizational complex functioning as an integrated homeostatic system unconsciously, we propose the term "Cyborg"' (Clynes and Kline, 1960). They continue: '[T]he Cyborg deliberately incorporates exogenous components extending

the self-regulatory control function of the organism in order to adapt it to new environments' (1960: 27). They predicted that the body of these space travellers would need a closed-loop feedback mechanism to regulate responses in space's inhospitable environment. In Clynes' original conception of the cyborg and others since then, these technological adaptations and implantations to the human body are seen as broadly acceptable, relatively risk-free and largely unproblematic for the individual. It was thought that the additions to the body required by the men during space exploration would not affect their identity. The adaptations would not necessarily affect who the men were. Indeed, as Clynes went on to suggest years later in the foreword to Halacy's *Cyborg: Evolution of the Superman*:

Will this (cyborg) change our fundamental nature? Not much more than glasses or iron lungs change it. The difference is merely that instead of using external or *attached* prosthetic devices, the man-made devices are now to be *incorporated* into the regulatory feedback chains – the homeostatic mechanisms that keep us viable for such an astonishingly long time.

(Clynes in Halacy, 1965: 8, emphasis original)

In this understanding, cybernetic alterations to the body do not affect the individual's subjectivity or relationships with others. Key to the original conception of the term cyborg is the regulation and surveillance of the body without the person necessarily being aware of it (Halacy, 1965: 75).

So according to the visions of Clynes and Kline, life on other planets could be accomplished by 'altering man's (sic) bodily functions to ... artifact-organism systems which would extend man's unconscious, self-regulatory controls are one possibility' (1960: 26). However, Clynes and Kline's 'cyborg-in-space' is now arguably a present-day and everyday actuality. A trip to outer space is not needed to create the cyborg, because a cyborg is created when 'the exogenously extended organizational complex functioning as an integrated homeostatic system' takes the form of implantable medical devices that are placed inside human bodies. This, I go on to argue, creates 'everyday cyborgs' through the insertion of smart medical devices that have cybernetic capabilities, as is the case with ICDs.

Cyborgs and grinders

Implantable medical technologies can be defined as cybernetic in Clynes and Kline's (1965) original definition as a closed feedback system. For example, an ICD can sense an arrhythmia, which is an abnormally fast heart rate. It then reacts by setting off a series of small electrical shocks termed 'cardioversion', attempting to stop the rapid heart rate. The ICD then re-senses and evaluates whether a more considerable shock is required to 'defibrillate' the heart to stop the life-threatening rhythm. This is a *shock* as it is both painful and generally unexpected for the individual. The firing of an ICD imposes a 'dual shock' in many cases; there is the emotional or psychological shock of its sudden discharge and comprehension combined with the physical shock (i.e., the immediate, painful sensation) of its function. Later, the events are communicated to health professionals remotely from the device or through investigation by clinicians.

Arguably, an ICD is cybernetic because of its control over the heartbeat, its ability to enact differing commands and then communicate the subsequent events. The ICD is a closed-loop system that does not accept or require any input from the individual with whom they are implanted (whereas open-loop systems such as glucose monitors do and are more accessible to the wearer) (Ransford et al., 2014). Rather the original description of a closed feedback system appears to fulfil Norbert Wiener's classic definition of 'cybernetics', from the Greek word 'kybernutos' meaning 'governor' of a system (Wiener, 1961) and can be paraphrased in terms as 'the device's ability to function autonomously'. That is, without human intervention.

The ICD's closed feedback loop system is cybernetic in the original definition as well as fulfilling Haraway's (1991) C3I (command-control-communication-intelligence) criteria that she mentions but does not develop. Therefore, swallowing a pill or riding a bike does not make someone a cyborg, although Clynes at one point suggested that 'once you learn how to do these things automatically [ride a bike] the bike becomes almost a part of you'. He termed this as becoming almost a cyborg, but more of 'a simple cyborg' (Gray, 1995b: 49). The cyborg may be distinguishable from current-day biohackers and grinders – those whose bodies are modified by the

individual. The rise of biohackers and so-called ‘grinders’ whose modifications range from Radio Frequency Identity Devices (RFID) and magnets implanted into fingertips bypass the biomedical expert system. In such cases, and given these implants have limited activity, permanency and bodily depths, they may be better conceptualised as being closer to tattoos rather than cybernetic systems (Radcliffe, 2011). In cases of hacking medical devices such as CIs or glucose monitors, this has occurred because the individual has been able to hack the devices’ open feedback systems, accessibility that implants such as ICDs do not offer. Moreover, such practices raise questions about who owns the implants and whose responsibility it is to be able to modify them and who is to blame should they malfunction (Quigley and Ayihongbe, 2018).

Academics such as Kevin Warwick began experimenting with electrical neural implants attached to his nervous system via his arm so that he could then control a robot arm on the other side of the room (Warwick, 2003, Warwick et al., 2003, Warwick, 2004, Warwick, 2008). Some artists such as Stelarc and Orlan experiment in modifying their bodies in more permanent and visible ways. The Spanish artist Neil Harbisson who has an extreme form of colour blindness uses an antenna device he calls an ‘eye-orb’ that he had permanently implanted into his skull, which vibrates differentially, causing him to feel different colours.¹ These activities all share elements of human agency and choice that is not shared by those whose modifications are implantable and are medically required to improve both the quality and longevity of life.

Smart and cybernetic? Creating other ‘everyday cyborgs’

In 2015 colleagues and I wrote two articles about how to define ‘smart’ technologies. We suggested that technology might have characteristics that were autonomous, responsive and sensitive:

Increased smartness can be about increased automation (quicker responses which minimise role of clinician/patient), and it can be linked to the complexity of what is being sensed and responded to (e.g., measuring multiple variables which may be technologically difficult to measure), processing and delivering an appropriate response. The importance of closed loop emphasises autonomy as a

main condition of smartness (autonomy/automation) as well as complexity of responsiveness.

(Haddow, Harmon and Gilman, 2016: 217)

At that time, we had not considered whether smart could also be considered as cybernetic or what the relationship between smart and cybernetic might be. However, there are other implantable devices apart from ICDs that are either used or in development that partly fulfil features of 'smart'. Given that cybernetic systems C3I overlap with elements of smart (e.g. autonomy, intelligence or responsiveness), some implantable medical technologies such as CPs, DBSs, CIs and IVBs might be termed cybernetic as well as smart which I turn now to briefly review.

Pacemakers for the heart and brain

A cardiac pacemaker (CP) can regulate and pace the heartbeat, effectively pacing the heart from an abnormally slow rate called a 'bradycardia', with a series of small electrical charges. It is sensitive to the speed and rhythm of the heart and can discharge when it senses a slow rate but not when the heart is regularly beating. CPs collect data about the functioning of the immediate environment (e.g., the heart) and provide therapy (e.g., releasing electrical pulses and/or an electric shock) in response and so are viewed as more 'active' than, say, heart valve replacements. CPs share many of the features of an ICD (and indeed many ICDs have pacing features) and are therefore an example of smart technology featuring autonomy, intelligence and responsive ability. With the addition of functions that might include wireless communications such as those an ICD has, they may also be termed cybernetic. Interestingly, when the first studies were done with those individuals who had CP implanted, issues arose regarding body integrity and image as with individuals implanted with ICDs years later (of which more discussion below) (Green and Moss, 1969).

Frequently presented as a 'pacemaker for the brain', deep brain stimulators (DBSs) comprise electrodes implanted in the brain, a pulse generator implanted in the chest (near the collarbone), and a subcutaneous wire connecting them. Intended to alleviate tremors,

stiffness and slowness caused by Parkinson's disease, reports suggest that DBS may have implications for improving lung function, memory and mood disorders such as depression. DBSs have been the subject of intense investigation as studies have uncovered: 1) very different expectations for, and tolerances about, chronic illnesses and the side-effects of their treatment, 2) the variety and progression of emotional response to DBS and 3) the need for greater cooperation between stakeholders to create realistic public perceptions of DBS. DBSs can significantly improve symptoms and like CP and ICDs take control out of the hands of the everyday cyborg. Because they are fully implantable and cannot be reached by the individual, they create new challenges and vulnerabilities (Gardner, 2013, Klaming and Haselager, 2013, Gardner et al., 2017, Gardner and Warren, 2019). DBSs have also been the subject of legal concern, for they have been known to cause significant personality change, which can have implications for capacity (Klaming and Haselager, 2013). Others suggest that they do not necessarily alter subjectivity despite the modern era's emphasis on the brain as the location of self noted throughout this book. This appears to confirm the 'ambiguity of embodiment' discussed elsewhere that personal identity is more embodied, relational and dynamic and that individuals are not reducible to their brains, despite the necessity of having one (Lipsman and Glannon, 2012, Gardner, 2013, Kraemer, 2013, Gilbert, 2017, Gardner and Warren, 2019, Gardner et al., 2019).

In terms of smart functionality, cochlear implants (CIs) can provide a sense of sound to those who are profoundly deaf or extremely hard-of-hearing. CIs do not restore 'normal hearing', but instead replace it by interacting with the environment and the auditory nerve. They are penetrative but not truly implantable as are CPs or DBS. An external part comprising a microphone, a speech processor and a transmitter sits behind the ear, and an internal component comprising an electrode array is surgically placed within the ear to stimulate the auditory nerve. The person can remove the outside monitor from their ear; they have an element of control over CI – a human operator can still control the device. Although not due to a lack of human control, CI recipients report that the device can cause them stress and vulnerability (Chorost, 2005). Partly, this is due to expectations about the device being unmet; the difficulty in tuning the devices; and continuing communication problems associated with childhood deafness (Stinson and Buckley, 2013).

The device can also lead to ‘non-auditory stimulation’ – where nerves around the site are stimulated by the electrical energy, and this can lead to facial twitching (Gray et al., 1998). Moreover, as Blume argues (1999), little consultation with the Deaf community meant that the development of the technology was initially met with varying degrees of resistance, rejection and ambivalence depending on individual circumstances (Stinson and Buckley, 2013).

Finally, in-vivo biosensors (IVBs) are an example of an implantable medical technology that is currently in development to enhance the accuracy of radiotherapy treatment for cancerous tumours (Haddow et al., 2015). Many tumours can be treated effectively with radiotherapy; however, some are stubbornly radio resistant. Biosensors may be able to demonstrate resistance by undertaking biological measurements of the tumour environment, assessing whether real-time fluctuations in oxygen and pH levels could be exploited to optimise the timing of treatment to overcome radiotherapy resistance. Our early social science research with recovering prostate cancer patients demonstrates a willingness to accept in vivo biosensors and enthusiasm for a more ambitious functionality that goes beyond the current ambition of a beacon system (i.e., identifying the timing and location for radiotherapy and providing information about the environment) leaning more towards an IVB that is a long-term surveillance system alerting when there is a reappearance of cancer tumours (Haddow et al., 2015). However, there was an undercurrent of ambivalence reported and periods of ‘acclimatisation’ or of becoming accustomed were mentioned. Indeed, initial willingness to have an IVB varied depending on the circumstances around their implantation and the concomitant evaluation of what will be lost and gained by the men. For some, the attraction of the IVBs related to the masculine image often found in *fictionalised* presentations of a cyborg rather than what the respondents termed a ‘leaker and a bleeder’. It is these fictionalised accounts I turn to next.

Cyborg as sci-fi monster

Modern-day implantable medical devices exhibit a range of smart and cybernetic functionality, and there appears to be a willingness of some to become an ‘everyday cyborg’ under certain circumstances.

However, using the term as a way to describe people is controversial due in large part to the cyborg's depiction in the genres of science and horror fiction. This is because as Turkle (2011) notes: '[W]e approach our technologies through a battery of advertising and media narratives; it is hard to think above the din'. In the public imagination the cyborg is a science-fiction monster born in the image of a technologically enhanced organism as portrayed in a multitude of books and films (Oetler, 1995).

Often the distinction between cyborgs, androids and robots is conflated; even by Clynes when he expressed horror at what his 'cyborg-in-space' had become in the science-fiction genre: 'Well at first I was amused and then I was horrified because it was a total distortion ... This recent film with this Terminator, with Schwarzenegger playing this thing – dehumanized the concept completely' (Gray, 1995b: 47). Perhaps Clynes might not have worried so much if he knew that 'Terminator' was not, strictly speaking, a cyborg according to his and Kline's criteria. Robots are fully mechanical, artificial, sophisticated devices with no organic elements, whereas an android, such as 'Terminator', is a robot that bears an external resemblance to a human or non-human living organism; neither is necessarily the cyborg that Clynes refers to.

Setting aside these differences when comparing fiction and reality, one of the most obvious distinctions between the science-fiction monster and the original Clynes cyborg version is that in the case of the former the cybernetic technology negatively affects the individual's subjectivity. These cyborg monsters are visible techno-organic hybrids typically, but not always, shown as being incapable of *feeling* or demonstrating emotions – they are portrayed as being both inhuman and inhumane. In science fiction, the cyborgs are the terrifying 'Borg' in *Star Trek*, the 'Cybermen' in *Dr Who*, or Alex Murphy in 'Robocop' who are typically presented as a cyborg monster bereft of emotions and feelings.² These cyborg monsters generally have the physical attributes of strength and power and overt musculature co-existent with the dominant Western idea of masculinity (Connell, 1995). Gray argues that gendering of the cyborg is not just prevalent in science fiction or even in the 'cyborg-in-space' versions, but explicitly with the technological focus and dominance found, for example, in the phrase 'toys for the boys' and adaptations and control of the male penis for sexual attraction

and intercourse (Gray, 2000). The sci-fi cyborg's technological adaptations simultaneously remove the ability for the cyborg to act humanely by adding technology to human materiality. That is, by removing human organic material and replacing or adding mechanical parts, the new techno-organic hybrid gains strength and power but at the cost of attributes such as empathy and compassion associated with being human.

The masculinity, as well as inhumanity of the fiction cyborg, is a trend that can be traced historically to the 'creature' created by a scientist 'Frankenstein' in the gothic novel by the author Mary Shelley (Shelley, [1831] 1993). A precursor to a body that is created entirely by assembling different organs, the monster created by Mary Shelley's 'Frankenstein' was a montage of materials from other human corporeal beings, but referred to as male nonetheless. In the introduction to the 1993 reprint, Jansson suggests:

For Mary Shelley, however, two of the most important aspects of science centre upon the essential 'masculinity' of scientific thought ... This 'masculinity' is most evident in the removal of any feminine element from the Creature's 'birth'; the scientific process activated by Victor excluded any sense of the humanity of the Creature.

(1993: x)

Frankenstein's monster, although not a cyborg, was a visible manifestation of a monster and, similar to modern-day depictions of robots, androids and cyborgs, they also need to be visible. Baudrillard notes the societal angst created by 'invisible robots', highlighting the perceived danger to human sensibilities of not making their 'inhumanness' (or otherness) apparent:

the substitution in question *has* to be visible: if it is to exert its fascination without creating insecurity, the robot must unequivocally reveal its nature as a mechanical prosthesis (its body is metallic, its gestures are discrete, jerky and unhuman).

(Baudrillard, 1996: 129)

A cyborg is more likely to represent this 'invisible danger' being referred to insofar as the inhumanness, and the subsequent threat, is not apparent due to the cybernetics being implanted and therefore the techno-organic hybridity not being visible. The ability to perceive inhumanness appears important so that the artificial exterior and the difference between 'us' and 'them' is realised.

In being unable to distinguish the cyborg amongst us it arguably creates ontological insecurity and fear.

On the occasions when a female cyborg (or indeed android) is portrayed, it is generally of an overtly sexualised female entity. Her technological modifications focus on specific aspects of the female biology such as the bikini area and on feminine traits such as the ability to listen or to be more emotionally literate. In the film *Ex Machina* released in 2015 and directed by Alex Garland, 'Ava' an android, passes the Turing test by using her emotional intelligence, femininity and (pseudo) submissiveness. Ava is from a long line of female androids, from 'Maria' in Fritz Lang's *Metropolis* to the film *Blade Runner*, featuring 'Pris' (the sex pleasure model) and Rachel (who exhibits human emotions) to '7 of 9' in *Star Trek Voyager*. In 2015, the UK Channel 4 series *Humans* featured the 'synths' with the mostly young, female characters as androids presented as either sex-bots or care-bots looking after the family.

A cyborg's mother – the liberator

The gendering of the android and the cyborg says as much about gender dynamics in present-day society (e.g. the strong rational male versus the emotional, sexual caring female) as it does about the future status of robots, androids and cyborgs.³ The gendering of the cyborg is dealt with critically in STS literature (Haraway, 1991, Gray, 1995a, Hayles, 1995) and feminist STS literature (Penley, Ross and Haraway, 1990, Kirkup et al., 1999, Henwood, Kennedy and Miller, 2001). In this literature, another version of the cyborg emerges which is most well-known by the feminist philosopher and social theorist Haraway, in her important paper 'The Cyborg Manifesto' (1991). According to Haraway, the cyborg is a 'cybernetic organism, a hybrid of machine and organism, a creature of social reality as well as a creature of fiction' (1991: 119).

Haraway's cyborg is a means in which boundaries between animals and humans, the physical and the non-physical and animal-human/machines, are dissolved (Haraway, 2003). As she argues, this is not about focusing purely on the technology per se but upon the socially structured relations amongst people that have been

historically constituted (1991: 165). Simply put, this is the way things are because this is the way they have been. The cyborg, for Haraway, I believe, is an ironic representation and abstraction to show how we are constructors of our cages – and the existence of the cyborg indicates the possibility of this to be different. She is using the cyborg as a tool in her ‘ironic’ Manifesto. Perhaps her Manifesto is, at first sight, a more playful one than a Marxist one, but its message nonetheless is a serious one. Haraway’s cyborg is an abstract representation that is needed to challenge existing schema regarding how in terms of cyborgisation the existence of gender division now requires subverting.

Haraway deploys the cyborg as a positive feminist metaphor and as a means of highlighting and invalidating the inherent impurity of any dualistic system thought or mode. The cyborg is ahistorical and post-gender with an ability to liberate from classificatory categories. Haraway used the term as an ontological challenge to the gender dualisms that carried inherent within them the power that causes an imbalance that is generally subverting the ‘woman’. The cyborg is a challenge to modern society but one that we are responsible for:

A cyborg body is not innocent; it was not born in a garden; it does not seek unitary identity and so generate antagonistic dualisms without end (or until the world ends); it takes irony for granted ... Intense pleasure in skill, machine skill, ceases to be a sin, but an aspect of embodiment ... We can be responsible for machines; they do not dominate or threaten us. We are responsible for boundaries; we are they.

(1991: 180)

However, machines are dominating and threatening, and technology is a reflection and is not (yet) a challenge to discriminatory practices. At the time Haraway published her *Cyborg Manifesto* in 1985, many people were already living with technologically augmented bodies for medical therapy. The unevenness of an ‘invasion’, charting who will be affected, and with what and why, is neither well-documented or understood. The everyday cyborg is not yet an icon of liberation envisioned by Haraway (1991, 2003). The everyday cyborg may reflect current socio-technological developments and biomedical practices that are reifying existing

inequalities in a cyborg society. This takes a concrete form when analysing data about who becomes an everyday cyborg as I turn to next.

Mending broken hearts

In the UK, government figures from the Office for National Statistics show that ischaemic heart disease is the leading cause of death in men, and the second leading cause of death in women of all ages (2001 to 2018) (Office of National Statistics, 2018). A heart attack causes most deaths from heart disease. Heart disease causes a plaque or a wax to build up in the arteries of the heart whose primary responsibility is to supply oxygen to the heart muscles that cause the heart to beat. Reducing the blood flow means clots are more likely, leading to angina and heart attacks. Those individuals who survive a heart attack may sustain some further form of long-term damage to their heart. Damage from a heart attack results in damage to the heart muscle, and this can eventually result in heart failure. A previous heart attack may scar heart structures, preventing it from working correctly (so-called ‘myocardial infarction’).

Moreover, having suffered a prior heart attack can be linked to the occurrence of a sudden cardiac arrest (SCA). The difference between a heart attack and an SCA is demonstrated best by using the image of a house whereby a heart attack is akin to a ‘blockage in the pipes problem’, and an SCA is an electrical fault. However, the former can also lead to the latter.

An SCA, therefore, is not the same as a heart attack, although it can be caused by having had one. An SCA is produced by cells in the ventricles of the heart (the left bottom chamber of the heart) firing electrical signals that cause the heart to beat faster than usual. This is known as ventricular tachycardia. In tachycardia, the heart beats at 120–200 beats a minute. Electrical impulses start firing haphazardly from different sites in the heart. The tachycardia can worsen into ventricular fibrillation when the heart beats in an abnormal rhythm that cannot be sustained by the body; the heart ‘fibrillates’ or quivers instead of beating and pumping blood. Ashcroft, quoting the 16th-century anatomist Vesalius, draws parallels between a

fibrillating heart and a 'writhing bag of worms' (Ashcroft, 2012). If this is not remedied by a strong electrical shock to defibrillate the heart, then a cardiac arrest will follow. The UK's National Institute of Clinical Excellence (NICE, 2014) suggests that of the 70,000 sudden cardiac deaths in England and Wales in 2010, almost 80 per cent were caused by heart arrhythmias (NICE, 2014: 5).

Heart conditions can be treated or prevented by a range of medications but also by the use of implantable cardiac devices. The ICD is viewed as the gold standard treatment for the avoidance of death from cardiac arrhythmias. Most cardiac mechanical therapies are devices used as a permanent intervention and are viewed as a successful, even underused, therapy (Burns et al., 2005). Once implanted, these devices are rarely removed, which can raise ethical issues around if and when communication of end-of-life decisions should be made (Kelley, Mehta and Reid, 2008) as I shall discuss later.

ICDs are increasingly sophisticated, and with the introduction of cardiac resynchronisation devices (CRTs) there is an additional ability to pace both ventricles of the heart in individuals who have advanced heart failure (CRT-P) and have the ability to discharge shocks (CRT-D). An ICD is relatively inactive and is in a low power mode to conserve battery, but it does have an ability to emit small electric shocks to convert a rapid heart rhythm similar to a CP. ICDs, unlike CPs discussed earlier, can treat many different types of arrhythmias that are fast (tachycardia) and slow (bradycardia) and can discharge larger electrical shocks when pacing and cardioversion has not stopped the arrhythmia. The ICD can discharge shocks up to 40 joules, which is much lower than an external defibrillator in a hospital could give (100–360j).⁴ Most people who suffer an SCA are unlikely to survive unless CPR (chest compression and rescue breathing) is given immediately or an electric shock is administered. Estimates are that only 7 per cent of adults who experience a ventricular arrhythmia out of hospital are expected to survive (NICE, 2014: 5).

Individuals who have experienced an arrhythmia will be implanted with an ICD. This is to protect them from a recurrence and is termed 'secondary prevention'. An ICD can be implanted electively for prophylactic reasons when a patient is at high risk of

a future arrhythmia but has not yet suffered one. NICE guidelines suggest that people who have conditions such as Brugada syndrome, arrhythmogenic right ventricular dysplasia, hypertrophic cardiomyopathy or QT syndrome are recommended to have an ICD prophylactically (NICE, 2014). These people may not have experienced a cardiac arrest but are deemed as being at a high risk of lethal arrhythmias due to the existing clinical pathology and hence are fitted for reasons of primary prevention.

Made by men for men

The UK’s audit system of ICDs and CP uses data to explore how different areas in the UK are performing in terms of the number of active cardiac device procedures being undertaken compared to the national averages (Buxton et al., 2006). In the UK, a Health Technology Assessment conducted in 2006 highlighted that approximately 80 per cent of ICDs were implanted into men and 20 per cent into women (Buxton et al., 2006). More recent and additional data on age and ethnicity is not yet available in a consistent form in the UK. In the US, such data is collected in a National ICD Registry. A published report based on an analysis of this data from 2006 to 2009 demonstrates that ICDs were more commonly implanted into white men who had not yet suffered a cardiac arrest so the procedure was undergone for primary prophylactic reasons:

Table 3.1 National ICD Registry (2006–2009): demographics, ICD indication

Age, mean (yrs)	68.1 ± 12.8
Male/female (%)	73.8/26.2
Race (%)	
White	82.8
Black/African American	12.1
Asian	1.0
American Indian/Alaska Native	0.4

Native Hawaiian	0.1
Other	3.4
Hispanic	4.9
Total implants (N)	486,025
ICD indication (N, %)	
Primary prevention	378,363 (77.9)
Secondary prevention	107,662 (22.2)
Primary insurance payor (%)	
Medicare/Medicaid	67.7
Other payor	32.3

Source: Hammill et al., 2010

Of the procedures conducted in the United States, 77.9 per cent were implanted into white men to prevent them having an SCA compared to only 22.2 per cent implanted into women. Undoubtedly, some of the differences in ICD implantation rates between men and women are caused by 1) a lower incidence of heart disease in women and 2) women presenting with symptoms of heart disease at a later age. Contextualised within the general ageing of the population (and of women in particular), more women than men die of cardiovascular disease in the US (Wenger, 2004: 558). Heart disease is the primary cause of death for both men and women in the US and disproportionately women of colour.⁵ Further, women are less likely to be treated for heart disease, and this is partly due to the fact that they are less likely to present with symptoms such as STEMI (ST-Elevation Myocardial Infarction) which account for approximately 25–40 per cent of myocardial infarctions in the US (O’Gara et al., 2013). A review of research by Yarnoz and Curtis (2006) argues that ‘the male dominance in device therapy can be rationalized from the higher proportion of men with CAD and serious systolic heart failure’ as:

Women have a lower incidence of CAD [coronary artery disease] and tend to present with this disease at a later age than men. Advancing age might *make implantation in females a less attractive therapeutic option compared with younger male counterparts.*

(2006: 297, my emphasis)⁶

Women tend to suffer from sudden cardiac death and myocardial infarctions roughly 20 years later in the life course than men do so the case for ICD implantation is evaluated on who is more likely to benefit, and the answer is that it is not an older woman but a younger man.

This social stratification of ICD implantations suggests that there is a form of ‘cyborg sexism’ when women who may benefit from ICD implantation are not offered one. Partly this discrimination may be due to technologising only the ‘bikini area’ of women, for example, with breast implants and contraceptive devices and, in the more recently publicised case of vaginal meshes, partly because what is assumed for men is (wrongly) applied to women (Wise, 2016, Wise, 2017, Rimmer, 2018). Some early evidence suggests a gender disparity concerning the implantation of DBS, and researchers argue it may be due to women’s preference not to be implanted (Shpiner et al., 2019). However, women fitted with contraceptive implants demonstrate a willingness to be implanted despite other alternative means of contraception that do not involve this procedure (Davie et al., 1996). The social stratification of cyborgisation or ‘cyborg sexism’ may remain an on-going concern.

An ambiguity of benefiting from cyborgisation – a new vulnerability?

The effects that ICDs have on individuals and their significant others is also troubling. Most psychological studies⁷ conducted with ICD patients repeatedly document the prevalence of anxiety, depression and even anger in the ICD population. However, this data cannot explain whether these emotions are a result of the implantation of the ICD, the activation of an ICD, discharging a shock or were pre-existing tendencies relating to the nature of the heart condition (Green and Moss, 1969, Tchou et al., 1989, Sakensa, 1994, Duru et al., 2001, Bunch et al., 2004, Kuhl et al., 2006, Birnie et al., 2007, Bunch et al., 2008, Pedersen et al., 2008, Yuhas et al., 2012, Vriesendorp et al., 2013, Asad et al., 2014).

Studies of men’s experiences with coronary heart disease show similar issues like those reported by ICD patients, for example, from a ‘loss of physical strength, emotional health, paid work, financial

security, independence, self-esteem, control, leisure activities, social life, pleasures (alcohol, a particular food, smoking, sex) and social life' (Emslie and Hunt, 2009: 177). All cardiac patients may develop some illness identity dislocations as they suffer from having heart disease, condition or arrest as well as from a near-death experience (Charmaz, 1995). An obvious starting point, however, is to compare features specific to everyday cyborgs that differentiate them from other heart condition patients. That is, the implantation of a cybernetic device into their body and its possible activation.

Implantation: outside-in

The surgery for the ICD (and CP) is generally conducted under local anaesthetic with a sedative given to the patient. The ICD's generator or battery is in a sealed case and inserted into the left-hand side of the pectoral chest with the leads fed down by the surgeon into the heart's atrium and ventricle. The leads or electrodes are vital to allowing the monitoring of heart rate and rhythms and delivering the shocks. This electrical circuitry monitors heart rhythm; makes the decision whether or not to administer a shock; delivers the shock; then monitors the response, judging whether more therapy is required and hence why, as I argued earlier, it can be considered cybernetic.⁸ ICDs can usually distinguish between arrhythmias in differing chambers of the heart, such as atrial fibrillation and ventricular tachycardia. This is important because atrial fibrillation causes a rapid heart rate but rarely requires a shock. The level of arrhythmia that the ICD detects is set by an electrophysiologist during implantation and can be modified (Vriesendorp et al., 2013).

The ICD is in a liminal location both in and on the body. It is placed inside the body and yet can be perceived on the skin as the generator causes a bump or a silhouette on the skin where it is implanted (Dalibert, 2016). It can both be touched and felt on the inside (integrity) and outside (image) of the body. An ICD and a CP can compromise the body's *integrity*, a term I introduced earlier referring to the inside of the body as a component of the 'Triad of I'. Some of Dickerson's participants told her, 'it's a foreign object in my body, close to my heart' and 'I need to get used to its

presence' and 'I am being controlled and regulated by a machine (Dickerson, 2002: 365). One participant discussed how she had delayed implantation: '[I] fought it for a long time. The thought of having some kind of mechanical thing in my body turned me off and I didn't want it. I resisted it [pause] just because it's something mechanical and not natural' (Beery et al., 2002: 16). Beery and colleagues describe how eventually all acknowledged the cardiac device as 'part of me', but it had not been without challenges (Beery et al., 2002). Nicknames were often used to refer to the device ranging from 'best friend' to 'foreign object', 'gift' and 'little sucker', which the authors argue are indicative that the women gradually acclimatised to the pacemaker.

Some studies have shown that women are more likely to report higher levels of body image concerns than men (Starrenburg et al., 2014) perhaps by causing particularly practical problems for women: 'I can't wear underwired bras anymore' (Tagney, 2003: 199). Other studies show that body image affects men and women equally, as the ICD's silhouette serves as a reminder of the purpose of the ICD, whose function is to save lives and is, therefore, evidence of the everyday cyborg's mortality:

Every time I look in the mirror I think, oh, you've got an ICD in your chest. There's a physical manifestation of what happened to me. It's something that happened inside my body, but I can see it every day when I take a shower. I look in the mirror and I see a little lump. Yeah, I think about what happened to me every day.

(Pollock, 2011: 100)

For Beery's cardiac pacemaker and Dickerson's ICD participants, an initial feeling of loss of control eventually transformed into a conditional acceptance (Dickerson, 2002).

Shocking functionality

ICDs provide painful shocks at unpredictable times – the defibrillation mentioned above. In many cases, these are 'dual shocks' as there is the physical shock (i.e., the sudden and painful sensation) of its function but also an unexpected shock. These shocks are likened to being 'kicked in the chest by horse' and scoring a 6 in a

pain-scale of 0–10 (Pelletier et al., 2002, Ahmad et al., 2000). The ICD shocks represent a near-death experience for the individual in terms of the fatal consequences if it had not fired, but one where the odds were against them in terms of their chances of survival without it. A review of research in 1999 suggested:

ICD-specific fears and symptoms of anxiety (e.g. excessive, worry, physiological arousal) are the most common psychological symptoms experienced by ICD recipients, with approximately 13–38% of recipients experiencing diagnosable levels of anxiety. Depressive symptoms are reported at rates that are generally consistent with other cardiac populations. Although the incidence of psychological disorders appears to be similar to that found in general cardiac populations, specific ICD-related concerns such as fear of shock, fear of device malfunction, fear of death and fear of embarrassment have been identified.

(Sears et al., 1999: 481)

A recent systematic review of the literature reiterates the findings that ICD patients are at an increased risk of mental health problems relating to depression, anxiety and panic attacks. Research with ICD patients leads Oudshoorn to suggest that, ‘Having a machine inside your body without knowing when or where it may jolt you induces feelings of disbelief and anxiety’ (Oudshoorn, 2016: 8). The more shocks experienced by the individual, the higher the level of anxiety (White, 2002, Withell, 2006). Of women who receive ICDs, it is reported they suffer more from increased anxiety and concerns about the ICD relative to men regardless of whether they had experienced shocks (Spindler et al., 2009). Some researchers suggest that moods, including depression and anger, cause arrhythmic events (Dunbar et al., 1999, Lampert et al., 2002). Although Whang et al. (2005) suggest that depression is an indicator for appropriate shocks, while others suggest that there is a risk of ventricular arrhythmia after implantable defibrillator treatment in anxious Type D patients (van den Broek et al., 2009). Oudshoorn suggests that cyborgisation created by the implantation of an ICD leads to two new types of vulnerability ‘as an internal rather than an external threat and as harm you may try to anticipate but can never escape’ (Oudshoorn, 2016: 267). Vulnerability is caused by the embeddedness of the technology, creating a paradox of both closeness and distance along with an

inability to control the device's functionality. As will be shown in the next chapter, however, the everyday cyborg believes they can create the circumstances in which the ICD has shocked them.

Identity and relationships

Issues around lack of control as well as body image and integrity appear to be important issues of the everyday cyborg. However, effects can go beyond the individual's body to alter the relationships they have with others, as well as the relations others have with them. 'Over-protectiveness' of significant others is often complained about in research with ICD patients (Dougherty, 1997, Eckert and Jones, 2002, Dougherty, Pyper and Benoliel, 2004, Insurers, 2004, Palacios-Cena et al., 2011). Dickerson's informants suggested, 'It has taken time for those around me to realize I can handle "stressful" scenarios ... They are always worried that my "heart" is not OK ... I think it's critical to educate others' (Dickerson, 2002: 367). This is a common complaint in those who have suffered coronary heart disease, so over-protectiveness may not be unique to having an ICD fitted (Emslie and Hunt, 2009: 177). Indeed, there is mention of a reduction in physical exertions including sexual (Craney et al., 1997) with reports of only 40 per cent of individuals resuming sexual relations (Steinke et al., 2005). Figures reported in the 'Sexual Activity and Cardiovascular Disease: A Scientific Statement From the American Heart Association' report that the risk of cardiac arrest during sexual activity is small (0.6–1.7 per cent) (Levine et al., 2012). It is noted:

partner overprotectiveness and the fear of shock with sexual activity are important concerns for the patient and his or her partner. Accordingly, sexual activity often decreases after ICD implantation. The sexual partner is not believed to be at risk from defibrillation if the ICD discharges during sexual activity.

(Levine, 2012: 6)

So cyborgisation caused by implanting ICDs in individuals is a matter of concern for the individual and equally important is the effects that go beyond their identity to alter relationships with others. There is, however, a risk that others may seek to affect the ICD with malicious intent as I turn to next.

Hacking

In 2007, the United States vice-president Dick Cheney had the wireless function of his pacemaker disabled by his cardiologist who is reported as suggesting: ‘It seemed to me to be a bad idea for the vice-president to have a device that maybe somebody on a rope line or in the next hotel room or downstairs might be able to get into – hack into.’⁹

Cardiac devices such as CPs and ICDs, are getting smaller, smarter and more interconnected, and accompanying this arises concerns about data security and system hacking. Unlike insulin pumps which are an open-loop system and can accept patient input (and indeed as shown previously are hackable by the patient), ICDs are cybernetic features which are closed-loop systems. They have software to be able to sense physiological changes in the heart, to ‘know’ when the appropriate time to emit a shock is, as well as being able to transmit this data remotely – they are cybernetic due to the prescence of C3I. Quigley and Ayihongbe suggest that it is due to the integration of hardware and software that controls the how, when and why therapy is delivered that is integral to the everyday cyborg (Quigley and Ayihongbe, 2018). In the UK, everyday ICD cyborgs can be offered a home monitor that uploads information from their pacemaker or ICD to the hospital through the landline or wi-fi internet connections. Instead of attending a clinic for a check-up, a virtual appointment is sent that tells the everyday cyborg when to pick up the device and place it on their chest over the ICD. Information is downloaded from the ICD inside the body through the device and sent to the hospital. A programmer can interrogate the ICD from in the hospital clinic. Medtronic is one of the largest suppliers of remote ICD monitors and as it states on its website:

The Medtronic CareLink® Network is the nation’s leading remote monitoring service, connecting cardiac device patients to their clinic from home or away.* As a clinician, you have 24/7 access – via a secure Internet website – to a wide range of trended reports offering information comparable to an in-office visit.† These diagnostic reports can be exported to your hospital network or EHR for greater accessibility to the data and clinical documentation. In addition, you can receive Medtronic CareAlert.® Notifications which provide alerts to potential issues before they become problems.¹⁰

Information can include whether the device has fired or not and the amount of battery it has left (which varies depending on how many shocks it has discharged). This has led others to conclude: ‘when a cardiac implant gains a wireless interface for clinical monitoring, it may expose the patient to malicious eavesdropping (a violation of privacy) or tampering’ (Halperin et al., 2008b).

There are two ways that hacking can affect cardiac devices through interfering with the radio frequency enabled aspect – either through theft of data or interfering with the functionality of the device. It is alleged that an attack could be made through using EMI waveform (electromagnetic interference).

With a carefully crafted EMI (electromagnetic interference) waveform and an implantable defibrillator with its leads in free air, the researchers confused the ICD’s sensors and tricked the ICD into delivering a defibrillation shock. (Ransford et al., 2014: 166)

As stated, ‘leads in free air’ appears to indicate that the ICD was not ‘confused’ when it was in the body. So, the attack was not made through the skin or muscle to the ICD when implanted. A report carried out for the European Commission in 2006 ‘Safeguards in a World of Ambient Intelligence’ (SWAMI) outlines scenarios where ‘remote homicide’ may be possible by hacking into devices and disrupting their software or signals to give wrong treatments or prevent emergency signals being responded to (Friedewald, Lindner and Wright, 2006). Other risks include forced battery depletion (Halperin et al., 2008b) and the ‘tracking of unwitting patients’ (Roberts, 2011, Ransford et al., 2014: 158). This latter example relates to the specific technology of insulin pumps that are neither embedded in the body nor have a closed-looped system. Although evidence is gathering that an attack on an ICD is possible, an actual hack into an everyday cyborg’s ICD to collect data or cause the device to malfunction is yet, I believe, to be unequivocally shown. Arguably, one of the largest challenges to any hacker is reaching the device that is partially submerged in the body. This is not to say that it cannot happen. There is far more evidence, however, to suggest that malfunctioning or inaccuracy of the ICD occur without necessarily being hacked.

Faults in the machine

Estimates suggest that approximately 60 per cent of ICD patients will receive a shock within their first two years (Buxton et al., 1999). Oudshoorn's (2016) review of ICD patients' accounts on social media highlights that some could anticipate or know when a shock was inappropriate or not. Inappropriate shocks occur mainly from: faults in the leads; the ICD over-sensing activity in the atrium of the heart instead of the ventricles; or the upper threshold being set too low for the individual. The ICD is more accurately described as a system, as it consists of leads and a generator. The leads that are implanted into the heart are arguably as important as the generator and battery itself; loose or broken leads can lead to inappropriate shocks or failure to cardiovert or defibrillate (Piot et al., 2015). In 2005, Medtronic undertook a voluntary recall of all 'sprint fidelis' leads because of concerns about this.

An investigation discovered that when compared to a previous version of the lead, predictions were that the sprint fidelis mortality rates would be significantly higher (Ellenbogen, Wood and Swerdlow, 2008). The issue relates to using a lead that is thin enough to make implantation easier for the surgeon (discussed in detail next in Chapter 4), but sturdy enough to be able to withstand the continued pressure from the heart's beat. In the US, others have noted that since 1990, 41 per cent of ICD and CP recalls were due to firmware malfunctions (Maisel et al., 2001). In 2018, a report of medical device recalls showed a 126 per cent increase occurring in the US, with ICD's featuring frequently on the list.¹¹

There is some evidence to suggest records of ICD activity can be inaccurate or contradict the experience of shock discharge by the everyday cyborg. Research has discussed the phenomenon of nocturnal shocks as 'phantom shocks' whereby the everyday cyborg reports frequent defibrillation during sleep, but upon interrogation, the device shows no activity (House et al., 2018). As shown in Table 3.2 below, ICDs can inaccurately record the date of arrhythmia incidents occurring in 2005 rather than 2007 (Halperin et al., 2008a: 33).

Table 3.2 Arrhythmia logbook report

Episode	Date/Time	Type	Zone/Rate bpm	Therapy/ Duration
1.230	23 June 2005 19:10	Spont	VF 222	Diverted
1.229	20 June 2005 12:08	Spont	VF 216	Diverted
1.228	21 May 2007 21:22	ATR	130	??:??
1.227	21 May 2007 15:01	ATR	121	06:20 h:m
1.226	21 May 2007 15:01	ATR	119	00:45 m:s
1.225	21 May 2007 15:00	ATR	120	00:11 m:s
1.224	21 May 2007 15:00	ATR	119	00:16 m:s
1.223	21 May 2007 15:00	ATR	118	00:07 m:s
1.222	21 May 2007 14:59	ATR	119	00:09 m:s

Conclusion: the call for everyday cyborgs

The increasing acceptance and reliance on technological fixes, such as implantable cardiac defibrillators (ICDs), are a feature of today's medical systems and therapeutic regimes (Clarke et al., 2010), the consequences of which I return to later in the book. Individuals are amongst us that are having to live life with bodies modified through implanted cybernetic medical technologies. The people who are living life with their cybernetic heart devices in their hybrid bodies I call everyday cyborg. In sum, so far, I have advocated for using the term 'cyborg' while being well aware of the controversy that surrounds the term. Apart from a few notable exceptions in academic research, 'cyborg' is a term that appears to be mostly avoided. Indeed, in the past, the term may have largely been referred to without the benefit of empirical data or an argument about the need for the term. Indeed, when the term cyborg has been used variously, the most well known is the cyborg models of science-fiction monsters, which are often confused with androids. The cyborg monsters, in particular, make most people feel unable or uncomfortable to consider any other forms of cybernetic organisms. It is the case, however, that everyday cyborgs do exist whereas sci-fi

monsters do not. The cultural baggage associated with the term 'cyborg' is hiding how cybernetic technology is socially stratified within the population, more available to some and not others, and thus why some groups are more likely (or not) to become an everyday cyborg. Despite Haraway's challenge and call for the cyborg to deconstruct dualisms, such as those that involve gender, the cyborg is a highly gendered trope both in science and horror fiction and, as argued here, an empirical reality.

The reference point for living as an everyday cyborg is a hybrid of a mostly fictional character and of the science-fiction caricature of a monster, not that of the original space-man [sic]. A common feature of all versions of the cyborg, however, is masculinity – male everyday cyborg, the space-man and the male cyborg sci-fi monster who transforms into an entity less human and therefore less humane. Here similarities in the different versions of a cyborg, diverge; the everyday cyborg becomes more vulnerable, more humane and requires strategies and support to cope with the vulnerabilities. The vulnerability that everyday cyborgs are susceptible to is different from other patients who do not live life as an organic-techno hybrid, although more research is needed to see whether an everyday cyborg created by the implantation of an ICD experiences the same or different vulnerabilities as one created by a DBS, for example. An ICD is cybernetic as its capabilities go well beyond that of other semi-implantable technologies such as CIs, and prosthetic technologies that do not have the ability to autonomously react to changes in their environment (Harmon, Haddow and Gilman, 2015, Haddow, Harmon and Gilman, 2016). Increasing the number of everyday cyborgs in society carries new challenges for a cyborg society.

Alienation on implantation

As I discussed in this chapter, creating different types of everyday cyborgs – machines in the human/cybernetics in the organism – pose different types of risks to the individual not solely on possible malfunctioning, but on the correct functioning of the technology, the bodily location of where it was implanted in, the reasons for it being implanted, the type of technology, and patient expectations

of the benefits. Questions about how different types and kinds of implantable technologies or materialities affect us appear remote and distant in ordinary life and daily routines. We are embodied, and the relationship between body image, integrity and identity (my so-called 'Triad of I') is a taken-for-granted experience and rarely a source for reflection. Our bodies, to a certain extent, are 'absent' (Leder 1990). Modifying the body through implantation and transplantation, however, can draw attention to the nature of the relationship that a person has with their body; indeed, centuries ago the philosopher Descartes showed in his reflections just how divisible the person and their body is. In the Cartesian biomedical understanding of the body-person, both aspects are separate, yet it is not always clear in our everyday experience of embodiment that we are not our bodies; in fact, being a body is a necessary precondition for the separation. Thus, the ambiguity of embodiment. Changes in organic materiality result in (or are expected to) altering subjectivity and narratives from organ transplant recipients suggest that the organs they received from another human donor cause subjectivity changes; a human source, the recipient narrates how she can take on characteristics from the donor incorporating their organ and attributes of their previous life. An organ from a pig placed into the body has the potential to contaminate not just the human body but the person, making the recipient like a pig (and there are beliefs about 'dirty pigs'). A preference for personalised organs, bioprinted from the person, is the preferred option and the safest as it avoids risks to subjectivity alteration from organic contamination (Sanner 2001a). These stories of the organ are important in producing variable effects in embodiment. Then different kinds of organic sources are believed to cause various changes to the human body and, subsequently, the person. This is not the case when it comes to different types of materiality, as is the case with cybernetic technology.

The everyday cyborg is uniquely embodied as a hybrid of cybernetic and organism, and there are multiple layers of vulnerabilities associated with the new body condition ranging from when the device is implanted and causing alienation (felt when the integrity of the body is breached and when it disrupts the body image). Indeed, in the case of ICDs, the technology is neither visible nor invisible but remains present. The ICD is an alien presence experienced by some everyday cyborgs as a presence and altering

their relationships with others (and indeed affecting the relations that others have with the everyday cyborg). As discussed earlier in Chapter 2, survey recipients claimed not to want a mechanical implant as it was perceived as being unnatural and uncomfortable. Such technological additions do not appear to alter subjectivity in the way that human or non-human animal transplants do. The machine is a different type of material that never came from a living being. It was made by a human but never came from a human. The cybernetic technology is not fleshy and has no previous association with any living being. There is no risk, therefore, of contamination of characteristics from the source. Technologies such as ICDs have been made and manufactured and have no association with living a previous life.

C3I functioning

The device's proximity into the body brings with it a remoteness and lack of accessibility, cementing the vulnerabilities caused by lack of choice to become cyborg by the inaccessibility of the cybernetic device. Its alien presence is felt on many occasions after implantation, mainly when it activates a discharge of shocks, leading to an unsettling question of who is in charge, or control of the everyday cyborg's body. Cybernetic systems are closed-loop systems that control aspects of the individual's physiological processes. It raises the possibilities that technology can and does go wrong – in the survey reported in Chapter 2, those preferring not to have a mechanical implant related it to ideas about reliable functioning whereby machines, break, rust and malfunction; 'technology and machines break more often than natural things'. Previous research with ICD patients confirms that inappropriate shocks do happen and cardiac devices have been the subject of recalls in recent years.

Nevertheless, the risks to the everyday cyborg stem not only from the ICD malfunctioning but carrying out the process that it was implanted into the cyborg body for – that is, to discharge electrical shocks to stop the heart going into a life-threatening arrhythmia. How such vulnerabilities are dealt with relating to implantation, subsequent cyborgisation and activation will be turned to in the next chapter when I focus upon what life is like as an everyday

cyborg, as related by them. In Chapter 4, I give voice to the everyday cyborgs about their own experiences of cyborgisation through the implantation of an ICD.

Notes

- 1 https://en.wikipedia.org/wiki/Neil_Harbisson (accessed January 2020).
- 2 When a robot ‘humanises’ as in the film ‘Bicentennial Man’ (1999) – he does so to the point that when he feels emotions and forms relationships, he suffers emotional angst about the meaning (and ending) of life.
- 3 The relationship between fiction and non-fiction became closer when researchers at Osaka University in China introduced ‘Geminoid F’, an android unable to walk but capable of eye contact and described by her fans as the ‘world’s sexiest robot’, see: www.cbc.ca/news/trending/world-s-sexiest-robot-causes-a-frenzy-at-beijing-tech-conference-1.3340974 (accessed November 2018).
- 4 www2.warwick.ac.uk/fac/med/research/hsri/emergencycare/prehospitalcare/jrcalcstakeholderwebsite/guidelines/the_implantable_cardioverter_defibrillator_icd_2006.pdf (accessed February 2020).
- 5 www.nhlbi.nih.gov/health/educational/hearttruth/index.htm. (accessed March 2020).
- 6 It was not until 2015 that the SynCardia Total Artificial Heart was modified and made smaller for women, see: www.sciencedaily.com/releases/2015/07/150701140901.htm (accessed November 2018).
- 7 Generally, such studies utilise survey methodologies of standard closed format questionnaires (Irvine, Dorian and Baker, 2002, Sears and Conti, 2003, Francis, Johnson and Niehaus, 2006, Kuhl et al., 2006).
- 8 www2.warwick.ac.uk/fac/med/research/hsri/emergencycare/prehospitalcare/jrcalcstakeholderwebsite/guidelines/the_implantable_cardioverter_defibrillator_icd_2006.pdf (accessed May 2019).
- 9 www.sciencemag.org/news/2015/02/could-wireless-pacemaker-let-hackers-take-control-your-heart (accessed March 2019).
- 10 www.medtronic.com/se-sv/healthcare-professionals/products/cardiac-rhythm/patient-management-carelink/medtronic-carelink-network-cardiac-device-patients.html (accessed October 2008).
- 11 www.aami.org/newsviews/newsdetail.aspx?ItemNumber=6475 (accessed February 2020).