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The imaginative technologies seen in science fiction today are no longer a dream because of the development of Radio Frequency Identification (RFID) biochips in our society. RFID microchips now have many different applications, from tracking young children, to Alzheimer's and dementia patients, to parolees. While trackability can provide comforts to concerned families and communities, there are also issues of an individual's right to privacy imbedded in the use of these microchips. So where do we draw the line between privacy and the safety of the individual and society? As we will explore in this paper, there is a fine line between the benefits and consequences of using these chips which will impact their role in the future.

Initially, privacy was not an issue for RFID microchips because they were not used for the purposes of tracking people. The biochip was more basic and the technology was not advanced enough to allow the microchips to be injected into people. RFID technology was used in World War II to identify and track ally submarines, ships, and planes (Brown, xi). Today's uses of these chips are much more advanced as they are much smaller and are implanted into humans for the purposes of identification and tracking. While there are still problems to address, the RFID microchips have become safer to implant than they were in the past.

It is for that reason that the chips were FDA approved in October 2002, and consumption by the public increased by 2003. The increase in implantation was mainly caused by the lowering in the cost and the availability of a higher speed transmission between the receiver and the chip's antenna (Brown, x-xi). The advancement of the RFID technology produced a biochip in two parts: the antenna that transmits a signal and the chip. This chip is a minicomputer that stores data

such as serial numbers that are unique to the user and can function within the tag in one of two different ways. There is an active tag that runs on battery for communication, but the more frequently consumed tag is the passive tag. The passive tag is dormant, but not off, until a reader comes within the frequency range of the receiver. The tag is able to communicate with the reader by sending the tag's data to it (RFID Journal-FAQS). This communication in the passive tags can create problems for the consumer, because any reader in the vicinity of the tag could potentially be able to communicate and receive the data from it.

Despite this issue of communication, the implantable RFID microchips can be used to benefit many people. For example, they are beginning to be used to protect the safety of patients in hospitals, specifically patients with Alzheimer's and dementia (Wolinsky, 966). Alzheimer's and dementia patients have trouble with their brain function, which causes difficulties such as remembering who and where they are as well as performing daily tasks, and it only gets worse with time. For these reasons, the American Corporation called VeriChip distributed these chips out in April of 2002, before RFID implantations were FDA approved (Masters, 6). Currently some hospitals and assisted-living facilities are beginning to distribute these RFID chips to their elderly patients for their safety. Because patients with these sorts of problems often have difficulty with short-term memory loss, injecting them with a RFID chip has shown to be more effective because it eliminates the risk of the patient forgetting why they have a bracelet on and taking it off. This is exactly what some assisted-living facilities in Palm Beach, Florida have tried. Approximately 200 residents in that area are currently using this technology as of 2008 (Kouri) and it is anticipated that this number will increase significantly in the years to come because of the many benefits. These microchips allow the hospital or facility to monitor the whereabouts of the patients, who can be a part of the general community and not be secluded to a secure

area. It also provides peace of mind for family members and caretakers while ensuring the protection of the patient.

While the RFID chips have also been used to protect patients, this is not the only case in which microchips are beneficial. Implantable microchips have been used to track criminals on parole in order to ensure the safety of the local community. While this method is not widely used, some places have tried implanting parolees with RFID microchips instead of using GPS tracking bracelets (Masters, 5). This has been useful because implanted biochips are not as easily removed as tracking bracelets. Problems can arise when criminals on parole break off their bracelet in order to avoid detection. However, by implanting potentially dangerous parolees, this can be prevented, ultimately protecting surrounding communities and aiding parole officers.

Criminals are only one of the dangers that surround us. Parents want to protect their children by any means and have therefore begun to implant RFID biochips in their children. With this chip, the parents can track where their children are at all times if the chip is within the frequency range of the receiver, which can be a large distance. This can be very useful in kidnapping cases; the child can easily be located with RFID technology. The use of the chip also works much more quickly, saving time and making the safe retrieval of the child much more likely to occur. This would also make the capture of the kidnapper possible. The RFID chip is so small and discrete under the skin that the kidnapper would be oblivious to its presence, making it more useful in this instance than a tracking device in a cell phone, which the kidnapper would throw away.

These RFID implantable microchips can be used to protect children in other ways. What if a troubled child decides to run away from home? Parents can use the biochip to track them if they are worried about their child returning to them. The child cannot remove it in order to avoid detection, unlike a cell phone GPS device, which they can throw away. Although

these benefits of RFID technologies are useful for the safety of the child, there are problems beneath the surface that need to be addressed.

While using RFID microchips can be very useful for all of these individuals, there are also some ethical implications involved with injecting them. One concern is seen when examining who makes the choice for these chips to be implanted. This issue has many similarities to the ongoing question of who decides when to be on life support. The Alzheimer's and dementia patients are not right in their mind, and are too confused to completely understand the situation to give their consent or choose to be implanted. Is it ethical for the family members to decide for them? Or is it an invasion of the person's privacy and too difficult for the family to make the decision? While the simplest answer may be for the family to choose, this can cause problems within the family. If family members have conflicting opinions, this often further hurts the relationships within the family when they already have the pain of seeing a loved one's health decline. In the future, one may begin to see elderly patients give consent before their condition worsens in order to solve this problem.

Similarly, the question of choice can also be seen in a situation where parents decide to implant a microchip in their child. This would most likely take place when the child is at a young age because the parent wants to protect the child. However, does the parent have the right to choose for the child? Can the parent make this decision because they believe they know better than the child? At what age is the child old enough to make his or her own decision? These are important questions to consider when thinking about implanting children with the microchips.

While the question of choice is an important consideration, the removal of the chip is also a concern that should be taken into account. The RFID microchip is much more difficult to remove than to implant, and complications are reported to have happened. Many people who have wanted to

have their microchip removed have reported that their doctors do not recommend such a difficult procedure. CNN reporter Robyn Curnow was implanted with a chip from the VeriChip Corporation in 2004 and wanted to have the chip removed. Her physician informed her that it was "a far cry from removing a splinter" which involves a scrupulous surgery. It seems that the biggest problem is locating the RFID microchip because it is possible for the chip to migrate further up the arm or even to a completely different body part. Because of this, X-rays must be used to locate the microchip. Curnow's doctor even had problems pinpointing the exact location of the chip with an X-ray because it was nowhere near where it had been inserted. Once the chip is found, the surgeon can't merely take the chip out, but rather must cut the tissue that develops around the chip (The Removable Microchip). This is not only a difficult surgery, but also extremely expensive.

In the case of Alzheimer's and dementia patients, the concern of removing the microchip is not an issue. Patients with Alzheimer's and dementia often decline rapidly and therefore, once implanted, the RFID microchip will need to remain in the patient for the remainder of his or her lifetime. However, this is a concern for children or criminals on parole, who will one day want to live without a tracking device in their body.

Difficulties presented in removing the chip introduce the question of whether or not this technology would still be useful in tracking criminals on parole. The problem arises when the criminal gets off parole. As previously discussed, the procedure for removing microchips can be very invasive and extremely expensive. If the parolee wants to have the chip removed, this procedure would have to be paid for by the government. And what about the possibility of the chip not being removed? This would mean that once the criminal is off parole, the chip would still be implanted in them. The privacy of the individual is then invaded, when all they want to do is begin a new life after they paid for their crime.

Invasion of privacy can also be seen in some situations with children, whose parents always want to do what is best for them. However, children cannot be protected forever: when is the right time to remove the chip, exposing them to the danger, and allow them to fend for themselves? At what age is it appropriate for children to live their own lives without the threat of having their parents be able to track their whereabouts? Parents wish they can protect their children forever, but at some point they must let them out into the world. The present method of withdrawing the chip has many problems that have yet to be resolved. A child needing a complicated and expensive surgery to remove a biochip that only serves a purpose for several years is another ethical issue raised with these microchip implants. If the chip can't be removed safely, the children implanted could still be tracked, even after they have grown up. This is a major violation of privacy that should be considered when thinking about implanting microchips in children.

Privacy could be invaded if the receiver of this device somehow gets into the wrong hands. This can be disastrous to the community when children and criminals are able to be located by the wrong people. Children can be found by pedophiles, and criminals tracked by others who want revenge. A receiver for these tags can be bought, simply on eBay and if a criminal were to get in close proximity to a child with a RFID chip, then they too can track him or her.

These same readers that are used to track the location of implanted persons can also be used to download the serial numbers in the microchip. This thereby gives thieves access to personal information. This makes identity theft a big concern. If the tags transmit your name along with the serial number carried in the chip, this new kind of theft can occur. While there are obvious benefits to using this RFID technology, there are risks involved with using them on identification cards, like credit cards. Jeff Schmidt, an independent security consultant, points out that these RFID tags were intended to be readable at

only short distances, such as a couple inches. However, counterfeiters could find ways to manipulate them to reach further. Schmidt told CRM Buyer Magazine that, "Radio waves just work that way -- given the right antenna, one can do amazing things" (Hook). Another concern is that the use of the RFID chips for protection against identity theft will lull people into a false sense of security, making it easier, rather than harder, for identities to be stolen. According to Schmidt, human inspection is the best form of protection and that using solely electronic protection could cause many problems (Hook). For these issues to be solved, the RFID chip must evolve and be able to be turned off in the case of an emergency, such as identity theft.

Currently there is no other way to turn these biochips off other than getting the chip removed and then maiming it in some way. Once the chip is implanted it stays on for the rest of the person's life. Because users of these chips are worried about their privacy and identification theft, one company called Philips Semiconductor Identification group is currently working on a way to disable these devices after they served their purpose without the danger of the invasive surgery (CNET Networks). Others are suggesting having the chips off at times and then turning them on when they are needed. Currently, such technology has not yet been invented. However, the University of Rochester and RIT are both working on this RFID technology to address the worries of safety and privacy of the people (LeFort).

Could RFID implantable microchips change the way we view privacy in the future? Despite challenges such as privacy, identification theft, and removal, the popularity of RFID chips suggests they will soon be part of normalized society. The concept of privacy has already changed drastically from the past, so is it possible that in the future it will be common to have an implantable device lying under the skin? Because of the numerous benefits involved in implanting these microchips, such as the protection of individuals and

communities, these societal changes are quite possible. If so, the RFID chip producers will have to address the presented issues, while humans must accept a less private lifestyle.

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