

Transmitting Insulin: The Design, Look, and Performance of Insulin Delivery Devices as Communication Technologies

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Abstract

In this article, we examine how insulin pens and pumps – two major devices for delivering insulin, the anabolic hormone used to treat Type 1 diabetes – are designed to conceal and fashion insulin delivery around their appearance as key communication technologies. Insulin pens and insulin pumps transform the aesthetics of insulin delivery away from the medicalized appearance of syringes toward that of beautiful technological artifacts. They both hide and draw attention to their status as technological artifacts and their medical use through a set of desirable, though sometimes incongruous, device aesthetics. Deliberately marketed around their resemblance to pens or pagers, insulin delivery devices are examples of skeuomorphs that “materialize the metaphor” of writing instruments and telecommunication tools into their design. We analyze how diabetes education and marketing materials present insulin delivery devices through skeuomorphic performances of use that uphold norms of concealment in diabetes self-management in conditions of social and medical surveillance. Drawing on patents, educational and marketing materials, and our own experiences with these devices, we argue that the skeuomorphic design of these devices morally regulates the embodied performance of diabetes.

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Introduction

Since the discovery of insulin in 1921, the treatment of type 1 diabetes has largely revolved around the injection of this anabolic hormone, which enables food to be broken down into energy that is usable by the body. Insulin allowed diabetics¹ to finally evade, or at least significantly delay, what had been known throughout much of human history as a death sentence of variable length. Before the mid-1980s, the hormone was injected via syringe and, although a variety of other delivery devices exist today, many people with diabetes continue to use syringes to deliver insulin on a daily basis. Tiny glass bottles of insulin and orange-capped syringes have come to stand in as visual symbols of diabetes. Perhaps more than any other medical object associated with the treatment of diabetes, the boundary object of the syringe brings the disease into legibility at the very moment of insulin delivery (see Star and Griesemer 1989; Star 2010). Drawing attention through its symbolic and performative dimensions, the syringe-as-boundary-object inscribes visible difference onto diabetic bodies, in ways that contemporary insulin delivery technologies have significantly transformed, and, in some ways, reproduced.

While a syringe and a vial of insulin very clearly mark the public performance of injecting insulin as an unmistakably medical one, more recent technologies such as insulin pens and insulin pumps enable diabetics to wear and use their insulin delivery devices as if they were common communication technologies. Insulin pens are designed to look like fancy and fun writing instruments, while insulin pumps have been designed to look like pagers and, increasingly, cellphones and smartphones, depending on the brand. Deliberately marketed as resembling pens or pagers, insulin pens and pumps share aesthetic design features with these communication technologies that help to conceal their function and use as medical devices. Combining designs for discretion and fashion, several aesthetic features also draw attention to these medical devices as beautiful objects to be looked at and handled, thereby enabling type 1 diabetics to manage and even obscure visible signs of their medical use, as disability scholar Graham Pullin (2009) analyzes in relation to assistive technologies for the disabled. They also communicate, and are used to communicate, socially sanctioned codes of behavior that govern how diabetics treat their disease and care for themselves in public, echoing Alison Kafer's (2013) insight that "neither assistive technologies nor our uses of them are ahistorical or apolitical" (120).

While certainly medical in purpose, and in some cases designed for disability, these technologies also play a communicative role both through their material design and their semiotic functions, in at least two other ways. Resembling ubiquitous communication technologies, they physically transmit insulin into the diabetic body: their A61M 5/00 patent classification identifies them as "devices meant for introducing media into the body in a subcutaneous, intravascular or

intramuscular way” (Cooperative Patent Classification 2020, 37). In addition to their ability to transduce media (insulin) into bodies, they also communicate through sound, image, and haptics, providing audible and tactile cues for those who are hard of seeing and hearing. Insulin pens “click” to signal standardized dosage amounts, while pumps offer vibrational alarms and touch-enhanced button pushes, along with other design features for disability. When we say insulin pens and pumps “communicate,” we mean in all three of these senses of communication. Our analysis will focus most centrally on how the devices signal information to users that shape the ways in which diabetics manage the embodiment of their diabetes in social contexts.

As Stephen Horrocks (2019) reminds us, type 1 diabetics are in “medically compelled human–technological relationships” (1). As medically necessary technologies, our diabetes devices enact what non-diabetic bodies would otherwise do biologically. We delegate to our technologies the tasks of measuring the amount of sugar in our bodies for the purposes of adjusting it, and providing insulin, which a non-diabetic pancreas would produce and adjust itself (Akrich 1992, 218; see also Latour 1988). As such, diabetics routinely engage with medical technology to satisfy two major facets of their disease management: testing blood glucose levels and administering insulin doses. We are able to test our blood sugar using blood glucose meters and continuous glucose monitors, the latter of which attach to our bodies and communicate wirelessly to mobile phones and insulin pumps through radio frequency. Insulin delivery occurs via syringe, insulin pen, or insulin pump, or a combination of these devices. Insulin dosages are determined by a variety of factors, including our blood sugar levels and the amount of carbohydrates we eat.

Diabetes is a way of *doing* chronic illness. It is not only a condition we *have*, it is also something we *do*, as sets of practices we engage through relationships with technology and medical instruments, and systems of quantification and insulin delivery (see Mol and Law 2004). Annemarie Mol and John Law (2004) explain that we do diabetes by *measuring* blood sugars, *feeling* the effects of low and high blood sugar and *countering* them, and *delivering* insulin, among a range of other embodied and highly technologized actions (50). In these processes of doing diabetes with technology, we are subject to norms of surveillance that are, in turn, embodied in technologies of insulin delivery and glucose measurement and our uses of them. Around these technologies, the discourses used to market and promote them enact the cultural and social enforcement of diabetes care and treatment as we perform it.

In this article, we analyze how insulin pens and pumps are designed and marketed to diabetics in terms of their ability to both conceal and render their diabetes visible, and thus legible, in the moment of insulin delivery. To do so, we identify and examine a set of patent designs, marketing materials, and medical

association promotional materials concerning insulin pens and pumps that are directed at type 1 diabetic users. Patent applications for insulin pens and pumps illustrate how codes of classed and gendered comportment appear in designs for and explanations of the devices and what users can do with them. The applications reveal how patents embody “a relation between knowledge and materiality” that get enshrined in property rights around technologies (Biagioli 2014, 384). We focus on the ways these applications diagram the technology and textually explain its operations and use. Other documents we analyze include a multi-page brochure for one of the first major insulin pens on the market, the NovoPen®, and archival photographs of the pen’s design, both of which are housed at the Smithsonian National Museum of American History, in their Division of Science and Medicine, in Washington, DC.² The archival photographs visualize the patented devices brought to market; they also locate the technology in a US national history of technological innovation and demonstration (see Pottage 2011, 623). The 1986 brochure serves as a key document in our analysis, as it represents the ways NovoPen® introduced this newly designed technology to potential consumers. We also examine online promotional brochures from insulin pump manufacturers, in which pumps are presented as lifestyle technologies alongside other communication technologies; and official Diabetes Association patient information from Ontario, Quebec, the US, and the UK that present insulin pens and pumps as being like fountain pens and pagers, respectively. The latter set of documents demonstrate how comparisons between insulin delivery devices and communication technologies have been standardized across national and provincial professional diabetes education sources, illustrating how the boundary object status of insulin pens and pumps—in place of the syringe—have been transformed into standards of device design (see Star and Ruhleder 1996; Star 2010, 614). We also demonstrate how these standards appear in magazine articles directed at audiences of diabetics, which review insulin pump designs around their aesthetic features and designs for disability (see *Diabetes Forecast* 2019).

These documentary materials reveal how insulin delivery devices are designed and promoted as technologies of diabetes concealment and self-fashioning, setting standards of use and design that differ from that of the syringe, and that model ways of embodying class, racial, gender, and employment differences under conditions of social and medical surveillance. Promotional and diabetes education materials model insulin pens and pumps as social technologies of concealment and beauty that are meant to assist diabetics in their management of the public performance of diabetes *as if* type 1 diabetes is a monitored performance of chronic illness. By monitored performance, we refer to the ways in which those living with managed forms of chronic disease like diabetes are subject to systems of surveillance that are enacted by medical personnel, family members, peers, and strangers (see Hall, Monahan, and Reeves 2016, 154–55). Additionally, we examine how type 1 diabetics respond to the promotion of these

devices around the aesthetics of communication technologies. Type 1 blog posts and meme propagators speak back to the rather incongruous comparison of insulin pumps to pagers, particularly in the current moment, and the awkward encounters that result from people misrecognizing their pumps as pagers (which the authors of this article also encounter). These responses show up in repeated iterations of internet memes and blog posts, suggesting that some type 1 diabetics share common, and often incredulous, reactions to the comparisons of pumps with pagers typically found in marketing and diabetes education materials. We focus our analysis on one typical meme representation of the insulin pump-pager comparison. We also draw on our own experiences with these devices as type 1 diabetics to demonstrate how norms of discretion morally regulate the performance of diabetes around the skeuomorphic relationships between insulin delivery devices and communication technologies.

Deliberately marketed around their resemblance to pens or pagers—skeuomorphs that “materialize the metaphor” of writing instruments and telecommunication tools into the devices of insulin delivery—patents and diabetes education and marketing materials present type 1 diabetics with normative models for how to perform diabetes using insulin pens and pumps, especially around norms of discretion in insulin delivery (see Gessler 1998, 230; quoted in Morris 2015). They foster what we call *skeuomorphic performances* of type 1 diabetes. Skeuomorphic relationships between insulin delivery devices and communication technologies shape understandings of how the technologies can be used. They also shape how type 1 diabetics manage the monitored performances of type 1 diabetes around social codes of race, class, and gender, as we analyze below. Skeuomorphs are design templates based on the look of older technologies that shape people’s understanding of new technological devices (see Hayles 1999). Jeremy Wade Morris (2015) explains that skeuomorphs “smooth the process of adoption” of new technologies through design features that “make new technologies feel more familiar” (50). They create what Jonathan Sterne (2020) describes as “an analogy of practice for users and a logic of equivalence” within the comparative relationships that are drawn between devices (180).

In the design of insulin devices as communication technologies, the skeuomorphic relationship does more than familiarize users with the new devices; it models how to perform diabetes with medical technologies that look less like medicalized artifacts, in turn transforming expectations of what diabetes technology can and should look like. As users encounter what is now a set of standard looks for the skeuomorphic design of their insulin delivery devices, they are met with a host of cultural connotations, expectations, and prescriptions for use that designers, marketers, and health educators further communicate. For type 1 diabetics, the look and use of these technologies powerfully shape our relationships to ourselves as diabetics, to other diabetics, and to non-diabetics. They model type 1 diabetes practice—specifically, the enactment of insulin delivery—by transforming the

artifacts of insulin delivery to look less and less like the syringe. As we deliver insulin, we enact a skeuomorphic performance of type 1 diabetes in conditions that are, and feel, monitored by others.

Drawing from feminist surveillance studies research in dialogue with performance and disability studies, we approach how insulin pens and pumps are modeled and marketed around the act of administering insulin in front of others as “monitored performances”: ways of performing diabetic subjectivity in the context of being monitored in medical and social systems of surveillance (Hall, Monahan, and Reeves 2016, 154–55). As other research identifies, norms of discretion powerfully structure the ways in which people come to inhabit type 1 diabetes in conditions of monitored performance and the relations of power and coercion in which they are enacted (see Broom and Whittaker 2004; Archer 2014; Lucherini 2016;). Many type 1 diabetics report feeling surveilled and monitored around their diabetes treatment. Diabetics, in turn, are encouraged to manage the appearance and performance of their type 1 diabetes treatment—notably their blood glucose testing and insulin delivery—in response to the familial, peer, and biomedical forms of surveillance that keep watch on diabetics and their compliance with medical treatment. Diabetics must work through and sometimes against those norms as they embody and perform their diabetic selves in relationship to the tools and technologies of diabetes management. Unevenly distributed across gendered, classed, and raced social positions, these technologies contribute to norms of discretion that can perpetuate feelings of shame and stigma felt by diabetics and shape an idealized successful subject with diabetes—one who can more easily “pass” as non-diabetic and who can reveal their condition at times and in ways that are less stigmatized and stigmatizing. Structures of surveillance around diabetes and its performance can thereby intensify practices of racialization, class discrimination, and other forms of systemic marginalization. The design of insulin delivery devices re-articulates and reproduces the experience and meaning of what it is to do diabetes as a form of monitored performance in these conditions.

The authors of this article have both lived with type 1 diabetes for most of their lives: Rentschler since age one and Nothwehr since age five. We have intimate experience with publicly performing our diabetes as people who also benefit from systems of race and class privilege—as white and middle-class individuals with access to private and provincial health insurance coverage—while also occupying other less privileged subject positions. We draw on these experiences as crucial tools of self-reflection and diffractive analysis—diffractive because our experience and expertise as diabetics enable us to tune into the “patterns of difference” that are produced through the entanglements of bodies, technologies, medical corporations, healthcare systems, and shared standards of diabetes treatment (see Barad 2007, 29; see also Murphy 2012). The differences between us also shed diffractive light on the ways diabetic difference is produced in relationship to

diabetes technologies. As such, we are attentive to the ways device design and marketing produces diabetic differences and enacts exclusions at the level of type 1 diabetes experience (see Barad 2007, 30; see also Haraway 1992).

To be clear, we do not claim to represent all type 1 diabetics, nor would we. Instead, our experience and expertise offer two situated perspectives on the forms of critical awareness that diabetics develop around how the disease itself, and its larger social meanings, emerge from our embodied experiences of the relationship between device design and public discourses about insulin delivery technologies. Drawing on Lora Arduser's (2017) study of type 1 diabetic agency as ways of "living chronic," we mobilize our experiential and observational knowledge of, and close attunement to, the marketing, promotional, and educational discourses around the insulin pens and pumps we use, and the ways we have witnessed and participated in their transformations over time. Our own relationships to the medical technology of the syringe, for instance, differ because of the almost thirty-year gap between our diagnoses. Rentschler was diagnosed in 1973 and used syringes until the year 2000, when she switched to an insulin pump for her insulin delivery. She never used insulin pens. Nothwehr was diagnosed in 2002 and their parents used syringes for roughly two years before switching to insulin pens. By 2007, they were using an insulin pump.³ The generational differences in how we relate to diabetes technology also defamiliarize some of our own diabetes-related experiences and strengthen our analysis of the "living system" of diabetes: that interrelationship between the embodied experiences of people with diabetes and the network of diabetes technologies in which we live (Forlano 2017). Some type 1's identify as "disabled cyborgs" as they maneuver through their relationships with technologies (see Forlano 2017). Some of us diagnosed very early in our lives might not experience diabetes as disabling in the same ways, particularly if we have avoided some of the disabling conditions many diabetics do, eventually, face. For some of us, diabetes may be experienced primarily as *chronic*, lifelong entanglements of bodies, systems, and technologies. Type 1 diabetes, therefore, is experienced and produced at the intersections of disabled and chronically diseased lives and the different ways we live and experience them.⁴

"Look Again": Selling a "Pen-Like" Insulin Delivery Device

The insulin pen made diabetes sort of sexy.
—Diabetes.co.uk, "Insulin Pens," YouTube video

When insulin pens were introduced to the consumer market in the mid-1980s, marketing materials described the device's resemblance to a writing instrument, making clear the skeuomorphic relationship between the technologies (see Figure 1). A marketing booklet for the 1986 NovoPen® system insulin delivery device—

one of the very first insulin pens on the market—made the resemblance explicit: “It looks like an elegant fountain pen but look again: It’s a really unique development in diabetes care” (Squibb-Novco, Inc. 1986; see Figure 2). A photograph shows the insulin pen resting on a leather-bound daily planner next to a leather briefcase and some sheets of dot matrix computer printer paper. An ink pen tucked into the binding of the daily planner highlights the skeuomorphic relationship between writing pens and the insulin delivery device. Readers see how the “material metaphor” of the ink pen has been designed into the artifact of the insulin delivery device and away from the look of an insulin syringe (Gessler 1998, 230; quoted in Morris 2015). Other sections of the NovoPen® booklet visualize the injector’s pen-like look in different contexts: in one, an insulin pen appears alongside carpentry tools, while another geared towards children with type 1 diabetes shows the device lying amidst color crayons and wooden pencils (Squibb-Novco, Inc. 1986a). The insulin pen’s appearance de-medicalized the look of an insulin delivery device, tying its design to writing technologies typically used in workplaces and classrooms. As Susan Leigh Star (2010) reminds us, boundary objects like the insulin pen materialize work arrangements between different actors, actors who, in promotional materials, often represent idealized configurations of both users and uses of the technology.



Figure 1. NovoPen® insulin delivery pen made by Squibb-Novco Inc., ca. 1986. Division of Medicine and Science, National Museum of American History, Smithsonian Institution, Washington, DC. Catalog number: NMAH-AHB2012q06840. Permission granted for use.

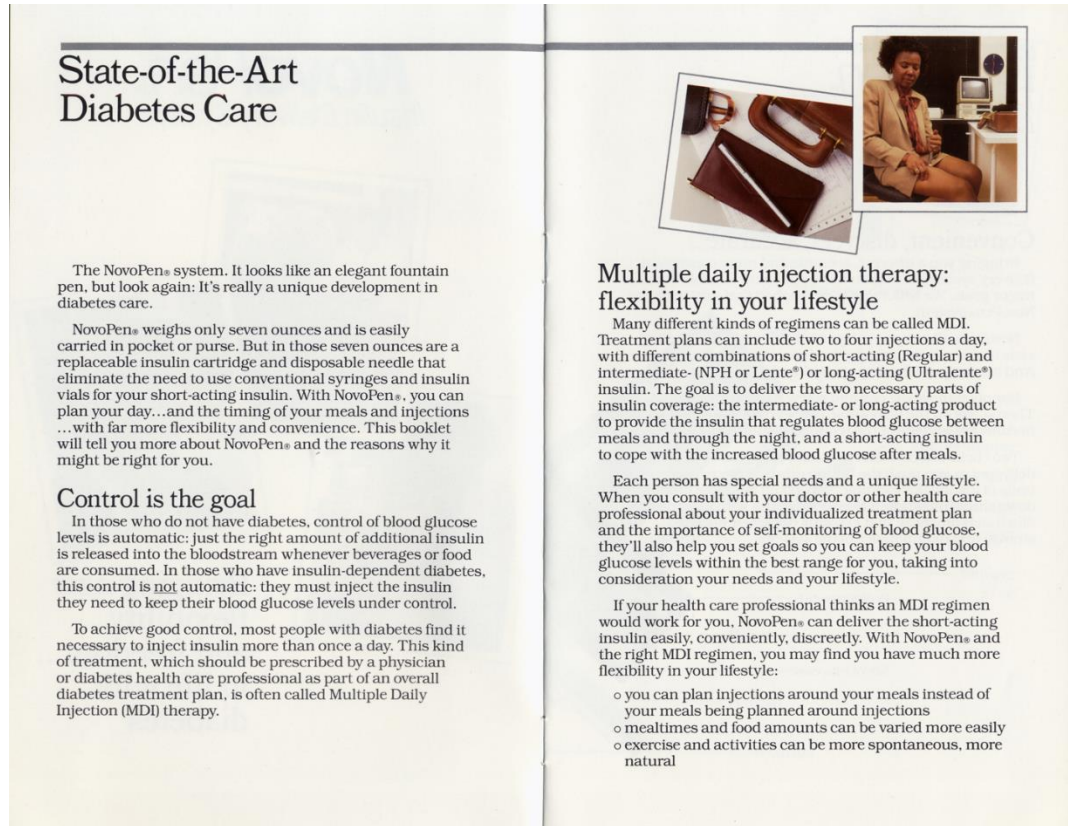


Figure 2. The 1986 NovoPen® booklet *State-of-the-Art Diabetes Care*. Division of Medicine and Science, National Museum of American History, Smithsonian Institution, Washington, DC. Catalog number: NMAH-AHB2012q06897. Permission granted for use.

The NovoPen® system's marketing materials communicate norms of concealment and discretion in the use of an insulin pen, suggesting that there might be something socially stigmatizing about taking insulin via syringe and being a person with diabetes. Around the object status of the syringe, when diabetics use a syringe to administer a dose of insulin, the visibility of this routine procedure can carry a sense of shame produced in part by discourses of health, able-bodiedness, and "diabetic control" as a moral obligation by which some diabetics report being governed (see Broom and Whittaker 2004). The ad copy in Figures 2 and 3 directly connects the ease and convenience of using the injector with the ability to perform injection discreetly. Jørn Rex, one of the people who filed the original patent application for the NovoPen® in 1984, identified discretion as an advantage of insulin pen use, "helping to render insulin therapy more socially acceptable" (Rex and Vogeley 1986). As he and his co-authors later explained, discretion is "particularly important to younger patients who may be especially sensitive to peer group approval and the embarrassment and stigma surrounding parenteral drug administration. Several students suggest that patients feel less conspicuous carrying a NovoPen® device and more comfortable using it in public compared with a syringe" (Rex, Jensen, and Lawton 2006, 398).

As tools of discretion, insulin pens were designed to enable type 1 diabetics to manage how their insulin delivery appears to others, and as disability scholars argue, “appearance is one of the main modalities by which disability is constructed” (Love 2015, 174; see also Goffman 1963; Davis 1995; Garland-Thomson 1997).



Figure 3. The 1986 NovoPen® booklet chapter “Convenient, Discreet, Accurate” in *State-of-the Art Diabetes Care*. Division of Medicine and Science, National Museum of American History, Smithsonian Institution, Washington, DC. Catalog number: NMAH-AHB2012q06898. Permission granted for use.

Navigating the potentially stigmatizing appearance of non-conformity, disability, and disease around insulin delivery, the insulin pen provided a different look to the work of doing type 1 diabetes. The insulin pen was specifically designed to not look like a syringe, even if it performs the same basic function. NovoPen® marketing materials explained the inner workings of the pen by detailing its syringe-like parts, representing how the pen *worked* like a syringe with its needle, needle caps, plunger, and barrel but, at the same time, looked nothing like one (see Figure 3). While the syringe largely remains the primary iconography of diabetes, it has an even stronger association with IV drug use. Insulin pen designs interrupt this association around classed iterations of non-syringe-based diabetes treatment technology. In the context of monitored public performances, the

visible “prosthetic object of the syringe,” as Nicole Vitellone (2003) argues in her analysis of IV drug users, orients the figure of the syringe-user around the “object world of the syringe,” such that the syringe carries the stigma associated with the act of injecting illicit drugs (42, 43, 46). Importantly, as Sara Ahmed (2010) explains, because affects circulate between objects in relational affective economies, emotions like shame can “[sustain or preserve] the connection between ideas, values, and objects” (230). As such, the moralizing rhetoric that demonizes IV drug use and the IV drug user operates as a vehicle of shame that, to some extent, becomes transferable to the diabetic syringe-user via the iconography and use of the syringe itself (see Lucherini 2016). Reinforcing this association, symptoms of diabetic hypoglycemia—low blood sugar—often look and sound like intoxication: slurred speech, incoherence, profuse sweating, confusion, and loss of consciousness. Racial and classed stereotypes of drug use further complicate these expressions of diabetic hypoglycemia for some diabetics. The object status of the syringe is therefore disproportionately “sticky” with negative affect that is shared between subjects associated with its use: IV drug users and type 1 diabetics.

As such, it is not unusual for type 1 diabetics to sometimes be mistaken as IV drug users due to the shared object world of the syringe, reproducing some of the shame of recreational drug use in the markedly different context of insulin delivery. Rentschler has experienced this common misunderstanding on several occasions, including an incident as a teenager in which her boyfriend’s father found one of her insulin syringes in the wastebasket, its needle broken off to avoid causing harm to those doing waste disposal. Because of the syringe’s powerful association with IV drug use, the man assumed she was injecting illicit drugs (this was also at the height of the US drug war in the 1980s). To clear up the misunderstanding, Rentschler had to explain that she was a diabetic who used syringes to inject insulin. Interactions like these are also documented in Mark Lucherini’s (2016) study of the performative aspects of diabetes treatment, where interview subjects describe the embarrassment that accompanies being mistaken for an IV drug user and the efforts they take to avoid such misunderstandings (266; see also Browne et al. 2014). While for the author this was merely an uncomfortable conversation, these interactions can have more serious consequences for racialized and less affluent diabetics who are more subject to being stereotyped and criminalized around perceived drug use.

Of course, despite its non-medical uses, the syringe is first and foremost an instrument used in the treatment of injury and disease. These conditions carry their own stigma, related to the highly personal yet often visible negotiation of bodily health and autonomy. As a disease whose management requires a series of lifestyle changes and adjustments, diabetics often *feel* and *are* stigmatized based on how others monitor and judge their behaviors vis-à-vis their personal medical care. How that management becomes visible to others becomes a site of

potential stigmatization, and, as one study stated, “Stigmatization is part of the social experience of living with T1DM for adults” (Browne et al. 2014, 1). In a recent survey of 12,000 diabetics, 76 percent of type 1’s report being stigmatized by others, while 52 percent of type 2’s report being stigmatized (Liu et al. 2017). As such, preferring to keep their condition private, some diabetics hesitate to disclose their disease to others (Pihlaskari et al. 2020). Studies also show that type 1 diabetics experience “diabetes distress” due to self-consciousness and social stigma, as well as the burdens of having to daily manage a serious chronic disease (Balfe et al. 2013). These findings echo Susan Wendell’s ([2001] 2017) explanation that “people with chronic illnesses are likely to be blamed or held responsible not only during the process of seeking a diagnosis, but also during every relapse or deterioration of their condition, which they are expected (by doctors, loved ones, employers, and the general public) to control” (170). Any “fluctuations in our illnesses and abilities...contribute to the perception that we are responsible” and that “we are doing something wrong” (Wendell [2001] 2017, 170). In the context of type 1 diabetes, “any failure in self-management may become bound to a sense of shame, producing a diabetes-shame-bind that is activated whenever criticized” (Archer 2014, 104). A failure to care for one’s diabetes, as some diabetics report, is often interpreted by others as a moral failure (Broom and Whittaker 2004, 23; see also Mol 2009).

Because of these complex negotiations with feelings of shame and experiences of social stigma, type 1 diabetes management has long been structured by concerns with discretion and privacy, as something to be “moralized for the benefit of those without diabetes” (Hall, Monahan, and Reeves 2016, 164). For type 1 diabetics in particular, “the shift toward constant and concealed treatment practices is emblematic of a much broader system of biomedicalized control that devalues non-normative bodies, and thereby devalues a life lived with(in) one” (Horrocks 2019, 3). Lucherini’s (2016) research found that “people with diabetes often express a sense of felt surveillance of their bodies when in public space” such that “being seen doing self-management could instill a sense of shame” (261, 271). He describes the labor type 1 diabetics do to “manage their self-management” of the disease in front of others (Lucherini 2016, 261), work that is moral and emotional, as well as physical and technological (Horrocks 2019). With technologies designed for discretion, like insulin pens, “the relative ease of concealing many of the management practices of diabetes” also “means that people can pass” as non-diabetic (Lucherini 2016, 269), shaping a form of moral labor involved in doing diabetes with technology.

Marketing brochures demonstrate how the insulin pen was designed for purposes of concealment as well as insulin delivery. Modeling the insulin delivery device as a pen familiarized the medical technology through its shared design features, in ways that could help diabetics manage how others might see and understand it.

The booklet for marketing the 1986 NovoPen® line emphasized the discretion that a pen-like medical device could provide as something users could wear as an accessory (see Squibb-Novo, Inc. 1986b). The clip on the exterior of the insulin pen (see Figure 1), for instance, suggested how the device could be worn in the breast pocket of a work shirt or blazer like a similarly designed ink pen, turning it into an accessory that could fit workday modes of comportment. The 1984 patent application for the device also described that the clip enabled users to wear it on a pocket, materializing preferred forms of user embodiment that were part of the legal case-making for the designer's property claims (see Rex and Vogeley 1986, 7). Each of the pen's design features follow a general principle similar to that of medical design for disability: "to compensate for disability as discreetly as possible" (Pullin 2009, 4).

Marketing materials and user booklets modeled the process through which one would use the pen to deliver insulin. In the NovoPen® brochure, photos show people using the device to deliver insulin across a variety of contexts during monitored performances of diabetes management. One image depicts a Black woman dressed in professional attire injecting insulin into her thigh as she sits at a desk (see Figure 2 above), communicating the image of a successful diabetic subject, someone who can manage a high-powered career and also fit the stereotypical image of health. Such images of control are often projected onto people with office or white-collar jobs, and who more readily appear as healthy and "normate bodies" (Garland-Thomson 1997, 8). In marketing photographs, the insulin pen appears to function as a social equalizer, providing discreet medical solutions to everyone. The Black woman is the only person of color shown using the device in the set of NovoPen® materials we reviewed from the Smithsonian Institution archive. She embodies norms of Black middle-class respectability that are portrayed alongside White-identified normate diabetic subjects of different ages and genders, including an elderly white woman and a male construction worker, firmly designating "healthy" bodily comportment through the performance of class, gender, and racial norms of middle-class professionalism, white working-class masculinity, and domestic white womanhood (see also Squibb-Novo, Inc. 1986b). All appear as successful diabetics who treat their condition in view of others without moral or social sanction.

The NovoPen® was designed to look like not just any pen but a *beautiful* pen that could signal the status value of the object, thus also communicating, potentially, the user's seemingly affluent or class aspirational status. The 1986 booklet for the device describes the design in detail: "The handsome nickel and chromium-plated brass construction provides durability along with the sleek fountain-pen look" (Squibb-Novo, Inc. 1986b). The emphasis on desirable aesthetics is also seen in more contemporary designs as well, of which online reviews make particular note. In 2020, a review details key aesthetic features of current pens on the market, describing a HumaPen brand pen as "extremely handsome," especially "for those

who are uncomfortable with the idea of pulling out syringes at work or during business conferences.” Another HumaPen is described as “an expensive writing instrument,” echoing insulin pen designs from the 1980s that could appear like professional objects (Tzemis 2020). The skeuomorphic design—and performance—of insulin pens to look like fancy writing instruments still holds today. For children and adolescents, pen designs use bright colors and fun decals. As a child in the early 2000s, Nothwehr used a NovoPen® Junior pen, which was marketed through its brightly colored patterns. New “smart” insulin pens also look like colorful and fashionable ink pens that are sold in specialty stationery stores.

The insulin pen thus fashions discretion around the sleekness, desirability, and appealing aesthetics of the technology in ways that recode the meaning and look of diabetes concealment and disclosure. Further emphasizing its aesthetic value, the insulin pen is not miniaturized to be hidden like a hearing aid nor flesh-colored like a prosthetic limb, common strategies for designing for discretion in disability (Pullin 2009). Instead, its design illustrates that “discretion does not require invisibility” (Pullin 2009, 15), but may instead demand a desirable aesthetic object, or what disability design researcher Sara Hendren (2020) calls “charismatic things”: devices that “not only work” but also have “elegant presence or pleasure in its handling, some kind of draw, a thing that pulls you in or makes you think while also being handy, modest, even garden-variety in its value” (8).

Using the pen to inject insulin in full view of others suggests that type 1 diabetes management can be done discreetly within the context of day-to-day activities, without violating expectations of normative public behavior, at least for some. Some marketing images transform public scenes of what might be viewed as humiliating into something that appears ordinary. In a photo used to market the 1986 NovoPen® device, a child sits in a chair injecting insulin into their thigh, pants down and underwear visible (see Figure 3). In many contexts, this image would represent a scene of humiliation, but instead the child appears in full view of their teacher and classmates, as if giving an injection of insulin might be analogous to other expected classroom behaviors. This image also communicates the supposed ability of the NovoPen® to shield children from shame related to syringes and appearing diseased. Such a negation of shame may be partly dependent on the child’s otherwise normative subject position—as white, seemingly middle-class, and attending school. As Lennard Davis (1995) argues, such performances of “normalcy must be constantly enforced in public venues, ... must always be creating and bolstering its image by processing, comparing, constructing, deconstructing images of the normal and the abnormal” (44). Across these marketing materials, images of successful diabetic subjects embody age-based, classed, raced, and gendered standards of morality expected of public diabetic bodies that appear otherwise normate.

The pen also models the type 1 enactment of disclosure, of “coming out” as an insulin-dependent diabetic, a condition disclosed through the use of diabetes technologies. As Ellen Samuels (2003) argues, “Narratives of people with ‘hidden impairments,’ like those of people with other nonvisible social identities, are suffused with themes of coming out, passing, and the imperatives of identity” (237). Samuels unpacks the analogies commonly drawn between coming out as disabled and coming out as an LGBTQ individual, two identities she herself shares as a lesbian disabled person, in order to assess how they are used in the process of revealing non-visible disability. For Samuels (2003), coming out as disabled is “primarily portrayed as the process of revealing or explaining one’s disability to others rather than as an act of self-acceptance facilitated by a disability community” (239). While there are a range of practices and meanings people give to the disclosure of non-visible impairments and chronic conditions, the practice of disclosure usually “connotes the daily challenge of negotiating assumptions about bodily appearance and function” by others (Samuels 2003, 239). As a queer person, Nothwehr has found that revealing their diabetes carries a different sense of shame than coming out as queer, although the emotional toll of disclosure is still considerable. For them, the shame of coming out as diabetic is strongly linked to fears of being pitied as someone living with chronic illness, whereas coming out as queer more often generates trepidation in relation to homophobic comments or outside expectations of their gender presentation or sexuality. The shame related to both forms of disclosure emerges in how others view, react to, and label them as the disclosing subject. Because diabetes is not typically visible in the same ways that sexuality often is, diabetics must negotiate normative assumptions of able-bodiedness by either divulging their stigmatized condition or working to appear, or “pass,” as normate as possible. In this context, the ability to pass as non-disabled, or as not having diabetes, may not communicate a desire to assimilate, but could instead signal resistance to norms of surveillance applied to non-normate bodies in order to avoid “the denial, mockery, and silent disapproval...used to inhibit us” (Samuels 2003, 242).

Type 1 diabetics use a range of disclosure strategies to inform others about their disease, from more performative models of revelation via the public use of diabetes technologies to other modes of disclosure where they introduce others to the disease and how it is managed. In Rosemary Garland-Thomson’s (1997) words, the successful diabetic subject who may casually use their medical technologies to disclose their condition is an example of “the constructed identity of those who, by way of the bodily configurations and cultural capital they assume, can step into a position of authority and wield the power it grants them” (8) based on the race, class, and gender privileges they have. These diabetic subjects are defined by virtue of *not* being those who appear as “marked bodies [which] shore up the normate’s boundaries” (Garland-Thomson 1997, 8).

While the NovoPen® brochure highlighted the ability to conceal the device's medical use and thus pass as non-diabetic, it also illustrated the contexts in which users could unveil what the device is designed to do, suggesting how users can exert some control over the moment in which they disclose their diabetes to others at the point of insulin delivery. In this way, the brochures trained insulin pen users in how to both conceal their insulin delivery devices and reveal their use for medical treatment through visible "scripts of use" (Akrich 1992, 208). Doing the work of "de-description," brochures modeled the "mechanisms of adjustment" users can engage in order to reveal their status as type 1 diabetics using an insulin pen (Akrich 1992, 209).

"What Year Is It?": The Insulin Pump-as-Pager

Insulin pumps—what inventor Dean Kamen called an "automatic syringe" after his 1973 design patent application for the device—are another technology through which type 1 diabetics infuse insulin into their bodies.⁵ Early insulin pump models took the use, purpose, and design of the syringe as a conceptual model and point of departure, envisioning the insulin pump as automating syringe-based insulin delivery. The AutoSyringe included a plastic syringe on the outside of the device paired with a motorized plunger that operated to deliver incremental doses of insulin at specified times. Kamen's design functioned as a mechanized method of using syringe technologies, with the device operating as a chassis that surrounded a syringe and automated its use. In fact, the external syringe was not concealed in any manner by the material design of the early insulin pump and was easily recognizable as a medical device, if not a somewhat unusual looking one at that (see Figure 4).⁶

More recent pumps have been designed to resemble communication technologies in a related move away from the aesthetics and look of the syringe. Over time, the pump has been continually redesigned to conceal its function as an automatic insulin delivery device, eliminating almost all easily recognizable design elements of the syringe. Making no mention of syringes or needles, medical brochures and online diabetes education sites from the 1990s and early 2000s instead routinely make comparisons between insulin pumps, pagers, and cellphones, around their shared technological resemblance (see, e.g., Novo Nordisk Pharmaceuticals, Inc. 2002). An image included in a medical journal article on insulin pump therapy from the early 2000s illustrates the comparison (see Figure 5). At the bottom of the photo, a black MiniMed 508 pump sits next to a black Motorola brand PageNet pager circa 2001, highlighting their similarities in shape, screen appearance, and button design. Two other insulin pumps appear at the top right of the image next to a silver Samsung flip mobile phone—the D-Tron pump, discontinued in 2003 (Disetronic Medical Systems 2003), and the H-Tron Plus pump, first approved for use in the United States for insulin delivery in 1991. The

visual juxtapositions draw a direct association between these insulin pumps and the design of iconic telecommunication technologies of the time.

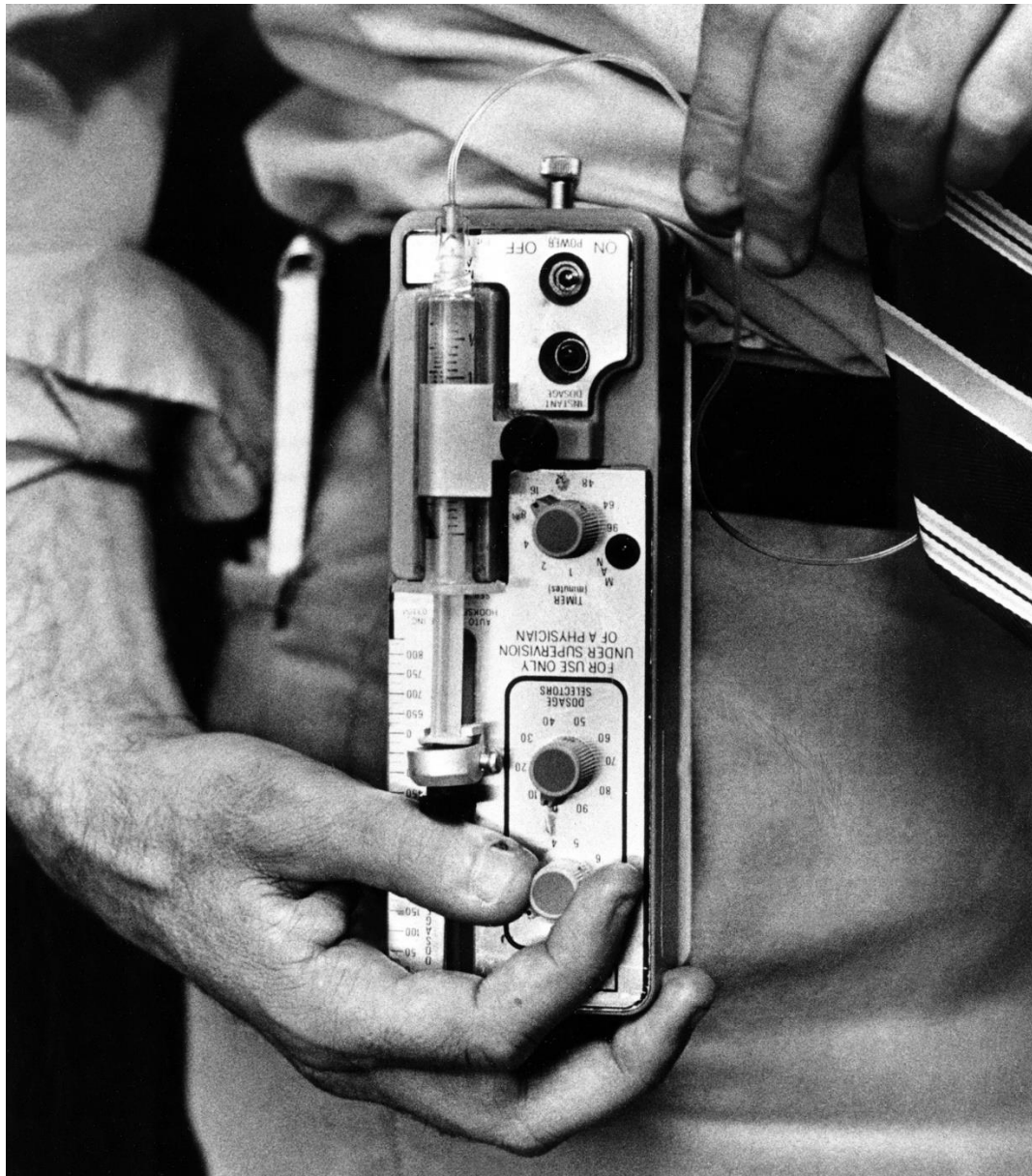


Figure 4. The AutoSyringe device for delivering insulin, shown here worn by AP photographer Patrick Connolly sometime between 1978 and 1984 (see Hurley 2014; Connolly 1986). The original caption to the image reads, "Associated Press reporter Patrick Connolly, in Seattle, Wa., Dec. 18, 1986, adjusts the insulin pump he wears on his belt to keep his blood sugar near normal. Connolly, who has had diabetes for 27 years, receives a squirt of insulin through a slim tube into a small needle under the skin of his abdomen every few minutes from the one-pound pump. For Connolly the experimental device is more effective than 10,000 insulin shots he has had. (AP Photo)." The date listed in the caption is inaccurate, however, because Connolly died in 1984 (see Connolly 1986). Permission granted by the Associated Press under license LIC-01416244.



Figure 5. The caption to the image reads, “The insulin pump is comparable in size to a cellphone or beeper. The cellphone in the upper left is similar to the Disetronic pump on the upper right. In the lower right corner, the MiniMed pump is comparable to that of a beeper on the left” (Jayarag, Davis, and McNeill 2001, 139).

Compared to the insulin pen, the insulin pump moves even further from the stigma of the syringe, towards the look—and haptics—of less morally fraught communication technologies. The look of the insulin pump distances it from both the visual appearance of the syringe and its methods of use, which, notably, the insulin pen does not conceal. The insulin pen still relies on the basic design concept of a syringe; it has a plunger, barrel, hub, and needle, which function in the same manner that a medical syringe would. The pen also necessitates a more public, and clearly medical, demonstration of its use as users must wash their hands, clean their injection site with rubbing alcohol, manipulate their clothing, and visibly inject insulin into their bodies using a needle. To administer a dose of insulin with an insulin pump, one must use the pump’s buttons or touch screen to input biometric information into the device, which is then used by the pump to calculate and deliver a dose of insulin through an infusion set attached to the body. Adhering to the skin, the set includes a flexible cannula to transmit insulin subcutaneously. As Laura Forlano (2016) explains, “as an information technology, the pump more easily fits into social situations than needles” and can go virtually

unnoticed as a medical device. With almost no visual cues of the pump's medical nature either through its appearance or use, in the early 2000s, Rentschler encountered students who thought that the clear tubing attaching her insulin pump to her body was an electrical wire connected to a battery pack in her pants, powering the "pager" she wore on her belt. At the time, pagers were still in regular use. The pump's resemblance to a pager also picked up on popular cultural connotations of the telecommunication device as something used by busy professionals, similar to the insulin pen's resemblance to a fancy fountain pen.

The misrecognition of the pump as a pager is not so much a failure to be properly oriented to the device but is instead a kind of success: the early description of the pump as pager-like still works, even as pagers have become outdated technologies. This is seen in how closely linked the look of the pump as pager-like is to how diabetics interact with and carry the device. Insulin pumps are, for some users, understood as technologies one *wears*, as if an accessory or fashion item; they are frequently clipped to people's belts and pants, as a pager would be. Diabetes education websites emphasize the pump as a tool or accessory of self-fashioning, stating, for example, "Most pumps are 'worn' on a belt, carried in a pocket, or attached by a holster and connected by thin plastic tubing to the infusion set" (Diabetes Education Online, n.d.).⁷ Describing pumps as something one wears, like prescription eyeglasses, "provides a shift in perspective from a *medical model* to a *social model* of prescription" (Pullin 2009, 19, emphasis in original). As Pullin explains, when prescription eyeglasses became "eyewear," they were perceived as fashionable items of clothing rather than medical devices. This suggests that diabetics form orientations to these devices based on how they physically *carry* or *port* the technology.

Advertisements and marketing material in the 1990s emphasized the skeuomorphic design of the pump-as-pager, highlighting its look as one of the draws of insulin pump therapy. At the time, manufacturers strove to reassure pump users that their insulin delivery device would be unrecognizable to others as a medical technology and would allow them greater freedom in their everyday life. Including testimonials from diabetic users, many advertisements stress the ability of pumps to be concealed as medical technologies that enable patients to lead "normal" lives, paradoxically linking concealment to the subject's sense of freedom and agency. Today's marketing of insulin pumps continues to emphasize diabetic freedom from social constraint. Recent advertisements show the pump being used in a variety of non-professional settings, such as classrooms and soccer fields. According to an online patient brochure for the recent Medtronic MiniMed 670G pump, syringe injections are "a distraction that...interfere with the normal rhythm of [patients'] lives" (Medtronic 2017, 2). Nicky, a high school student, credits the pump with helping her enjoy family meals "without having to excuse herself to inject insulin," while John, a family man and business professional, is shown on a business trip, able to juggle meetings and conference calls because

the MiniMed 670G pump is “on the job too” (4). In this context, normalcy alludes to ways of performing diabetes that are easily folded back into normative ideals of a meaningful and successful life: family time unencumbered by the stress of chronic illness and a professional career driven by capitalist modes of productivity and fulfillment. With the pump, users appear as self-fashioned subjects who are no longer defined by their relationship to the device—as students and athletes—and convey very specific forms of subjectivity formulated around ideals of youthful and active embodiment. Because these technologies blend into the background, both to the user and to others, the diabetic subject can move through life “like anyone else,” enacting norms of discretion with the pump that offer visions of ease in social and familial situations.

Although a 2018 study found that approximately 30 to 40 percent of type 1 diabetics in the US use insulin pumps, these numbers are likely higher now due to the increased availability of pump technologies (Umpierrez and Klonoff 2018). Increasing usage does not necessarily mean that the technology is more economically accessible, however. As of 2015, an insulin pump cost about US\$6,000 and supplies for the pump cost \$3,000 to \$6,000 annually, a staggering amount for the vast majority of diabetics, even for those with health insurance coverage that pays a portion of the costs (McAdams and Rivzi 2016). As of 2015 in Canada, all provincial health systems provide coverage for insulin pumps and their supplies for children up to age eighteen and some up to age twenty-five; only one province, Alberta, provides coverage for adults after the age of twenty-five (Diabetes Care Community 2015). Many adult Canadian pump users do not have private insurance to cover the costs of pumps and their supplies, and cannot afford the costs on their own, forcing some to have to abandon pump therapy for injections (see Bergen 2019). The sheer cost of insulin pump technologies and their supplies carries clear financial and class implications. Diabetics who are able to afford the pump and its related costs have, in turn, more access to preferred treatment regimens than those who cannot. It may also be more difficult for diabetics who cannot afford the pump to conceal their condition in public, thus situating those without access to the necessary resources to be viewed, potentially, as less successful diabetics under conditions of monitored performance.

Even though insulin pumps are expensive, they do not necessarily look like sophisticated modern technologies. Many still look like the outmoded pagers of their earlier skeuomorphic design and are still described as such to consumers. A University of California-San Francisco diabetes education site explains to potential users that “insulin pumps are the size of a pager, and fit in your pocket” (Diabetes Education Online, n.d.; see also Diabète Québec 2020, Canadian Diabetes Association 2013). *Diabetes Forecast*, the monthly US magazine about diabetes published by the American Diabetes Association, explained the look of the device with a potential witness in mind: “If you've ever seen a person with diabetes

wearing a pager-size gadget on his or her hip, you've probably seen an insulin pump" (*Diabetes Forecast* 2009). Describing the pump through the eyes of another subject suggests that the skeuomorphic design of the pump-as-pager is as much for the non-diabetic viewer as it is for the diabetic user, if not more so. The skeuomorphic relationship between the pager and the pump, then, persists, doing a form of cultural work that is meant to familiarize users and non-users alike to the insulin pump around their technological resemblance.

Today, pagers are largely understood as vintage technologies; many are sold on eBay as theatrical props rather than functioning text messaging machines. The pager-like look of the pump could itself be understood as a theatrical prop used to conceal its use to non-diabetics in the performance of type 1 diabetes care. To echo Raymond Williams (1977), the pager may have been "formed in the past, but it is still active in the cultural process...of the present" (122). The strange "residue" of the pump/pager relationship might "guide us to this presence of the past" in the ways some insulin infusion pumps continue to be designed and marketed around the look of this older technology (Acland 2007, xxi).

In light of the strange persistence of this design, insulin pump users have developed a range of vernacular responses to being asked about their pumps in disguise as pagers. Some diabetics respond with humor, critiquing the pager as a technology cast out-of-time (see Figure 6). Memes about the misrecognition of insulin pumps as pagers populate type 1 diabetes meme sites, giving popular cultural form to a kind of response insulin pump wearers might use to disrupt the misrecognition of their device as a pager. We draw attention to one common meme that appears online in Figure 6. The meme uses an image macro of actor Robin Williams in a scene from the film *Jumanji* (1995), when his character, Alan, asks two bemused children and a suspicious police officer "What year is it?" after he has escaped from a board game in which he'd been trapped for twenty-six years ("What Someone Is Probably Thinking" 2018). Commenting on the obsolete or out-of-sync phenomenon of the pager/pump comparison, the meme conveys the confusion that accompanies the device's incongruous appearance and anachronistic design. After all, to a non-diabetic person, the pump resembles a pager but is temporally and contextually displaced from its more prevalent use in the 1990s, leading to the assumption that the pump is not quite a pager but is also not a technology that is immediately recognizable.

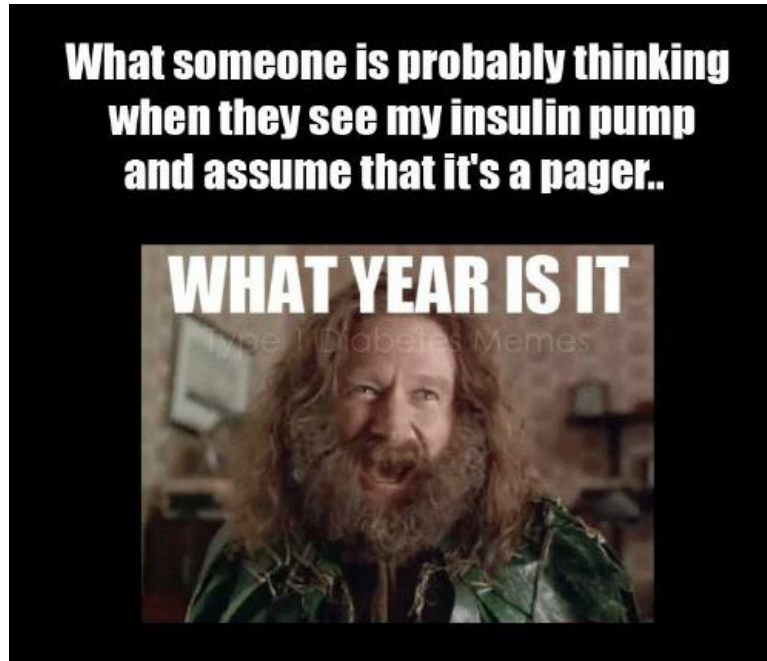


Figure 6. “What Year Is It?” Robin Williams meme on pagers as obsolete technologies in comparisons to insulin pumps (“What Someone Is Probably Thinking” 2018).

The question then becomes, what is it really? As Sara Ahmed (2007) suggests in *Queer Phenomenology*, for technologies, “the object itself has been shaped for something, *which means it takes the shape of what it is for*” (46, emphasis in original). Through its skeuomorphic design, the insulin pump communicates that the device is something that it is not: a pager. The look of the pump-as-pager suggests that the pump is in some sense not only meant to appear as a communication device, but that it *is* a communication device, transmitting insulin from a pump reservoir into the body but also communicating norms of diabetic comportment based on concealment. Their designs as communication technologies, as we have been arguing, also evidence how they communicate social norms about diabetes comportment that enable diabetics to “manage the self-management” of their disease in view of others (Lucherini 2016, 261).

Some patent applications make the connection between insulin pumps and communication technologies even more explicit. A patent filed in 2012 by Bigfoot Biomedical, Inc. for an insulin pump media player takes the pump-as-communication-technology one step further by designing mobile music playback capabilities into the pump, replete with a hard drive and headphone jack. A diagram included with the patent application shows a pump user listening to the band Van Halen’s 1988 song “Cabo Wabo” via the insulin delivery device, revealing something of the designers’ taste culture and their imagination of who their users might be: fans of the band Van Halen (see Figure 7). While the pump’s material design still resembles a pager, the capabilities of this pump suggest an

additional use as an MP3 player. Note how the user is pictured in the diagram with their headphones plugged into the insulin pump. According to the patent application, “in particular embodiments, the portable infusion pump system can serve a dual purpose of providing medication and entertainment for the user from a compact and unobtrusive device” (Wenger, Estes, and Chiang 2016), combining the aesthetics of discretion with a new articulation of the pump as a media player. While to our knowledge an insulin pump media player has never been brought to market, the patent application reveals how pumps are *expected* to be understood as communication technologies.⁸ The design for the insulin pump-media player takes this association to its logical conclusion. The idea of the pump as a wearable communication technology that is also associated with media players appears as well in marketing images of headphone-wearing pumpers, *as if* there is an embodied relationship between insulin pumps and media players, even when they are not combined into the same device (see Figure 8).

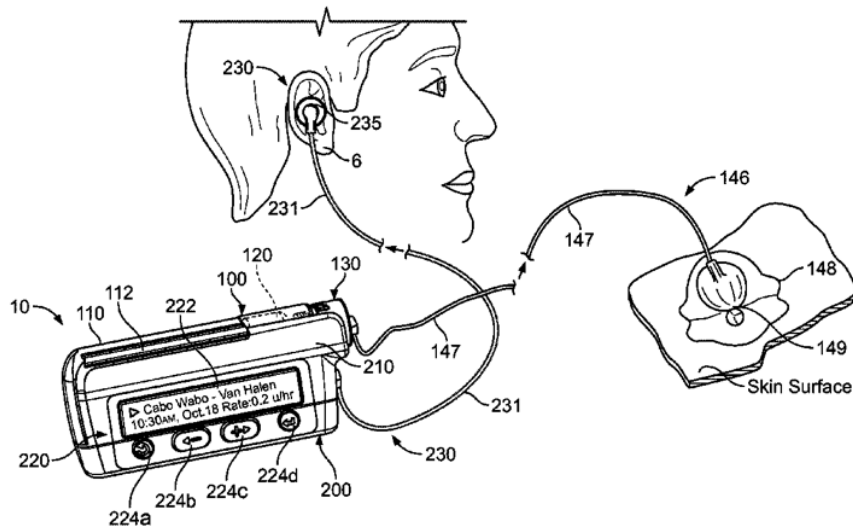


Figure 7. The insulin pump-media player diagram in a US patent application for the device (Wenger, Estes, and Chiang 2016).



Figure 8. John, a Medtronic 670G pumper, wearing headphones. Screenshot from Medtronic marketing packet on the 670G pump model (Medtronic 2017).

In response to this, some pump designers and manufacturers have recently begun to update pump designs, like that of the Tandem t:slim X2, which both authors of this article use, to resemble sleek smartphones with slimmer profiles, full-color touch screens, button-based wake up and shut-off features, and silver accents (see Figures 9 and 10). Compared to the pump-as-pager design, this new skeuomorphic relationship is arguably more successful in articulating the appearance of the insulin pump to that of an aesthetically desirable communication technology in the present moment. In its online marketing, the current Tandem pump is often pictured from the front, with its full-colour screen illuminated in ways that make it appear like something akin to a smartphone screen. Sometimes the pump is pictured alongside a smartphone to demonstrate how the pump communicates with a continuous glucose monitor that sends data to a mobile phone app. But it also communicates how closely the pump also looks like a small smartphone (see Tandem Diabetes Care, Inc. 2020). While these new pumps appear like smartphones, they act quite differently. For Forlano, the

smartphone-like pump does not so much recede out of perception but instead beeps, alarms, and requires attention from its user as a needy and rather obtrusive device. “Their sounds diverge from the familiar family of Apple iPhone ringtones. They speak in tongues. The uninvited stranger at the dinner party” (Forlano 2016). The promise that the pump will recede from view and blend in to one’s outfit through its design as a contemporary communication technology, then, may shape a visual relationship between diabetics and non-diabetics more than the embodied, sonic relationships diabetics have with their insulin pumps. Diabetics can also easily recognize each other’s pump technologies and the unique sonic alarms they use, shaping our relationships to insulin delivery devices in ways that complicate their abilities to hide diabetes. Hearing the sonic alarm of one of our pumps, the authors of this article have on more than one occasion asked the other, is that you or me?



Figure 9. Side view of Tandem t:slim X2 pump (on the right) and an iPhone 8 (on the left). Note the similarity of the on/off buttons and the comparable thinness and shape of the two devices. Photograph by Carrie Rentschler.



Figure 10. Screen view of Tandem t:slim X2 pump (on the right) and an iPhone 8 (on the left). Note the similarities of the device shape, touch screens, and protective glass screen shields, and the shared look of the black cases. Photograph by Carrie Rentschler.

Conclusion: Skeuomorphic Relationships as Scripts of Morality

By using medical devices designed not to look like syringes, type 1 diabetics manage the relationships between self and other as skeuomorphic performances of doing diabetes with technology. The insulin pen and insulin pump provide a kind of “cover” for type 1 diabetics, a way of wearing medical technologies that look like fashionable and ubiquitous communication technologies, even ones that are, for all practical purposes, obsolete, like the pager. As our analysis has demonstrated, administering one’s insulin is a monitored performance of diabetes self-management, a moment many diabetics experience as an exposure of one’s diabetes to others that is governed by norms of gender, race, and class differentiation, and exclusions. Like many other chronic diseases, diabetes remains a hidden medical condition until it becomes visible, and legible to others, at the moment of its management via medical technologies (Lucherini 2016; see also Mol and Law 2004; Hall, Monahan, and Reeves 2016, 163). The design of diabetes technologies to help conceal what is already meant to be hidden helps diabetics manage those disclosive moments of self-management (Lucherini 2016, 260), through insulin delivery technologies designed to look less and less like syringes and more like pens, pagers, and smartphones.

As functional technologies, the design of insulin pumps to look, feel, and act like communication technologies materializes a broader set of cultural meanings, and practices, tied to insulin delivery that also negotiate the distinctions between diabetes as a chronic disease and diabetes as a disability (see Balsamo 2011). As feminist disability scholars argue, it is in part in the “performative uses of technology” through which we “transform the meaning of functional technology from rehabilitative or adaptive to cultural” (Hamraie and Fritsch 2019, 18). Our analysis of the performative aspects of doing diabetes with skeuomorphic technologies contributes to scholarship in feminist disability studies and STS research around these skeuomorphic performances and what they reveal about type 1 diabetes as a socially differentiated set of experiences, and realities, of living a chronic life in relation to medical technologies. As scholars of media and communication studies, we are also acutely aware of the significance that the design and marketing of insulin delivery devices as writing instruments, pagers, and smartphones play in the meanings that medical corporations and diabetes education give to these technologies, and the larger social roles they are delegated to play in scripts of gendered, raced, and classed diabetes performance. These meanings crystallize in the devices themselves and in the documentary materials around which they have been designed, described, marketed, patented, and trained for use. While these devices transmit insulin, they also communicate much more than that: they embody ideals of success and failure in chronic disease management; they model fashionability and prescribe aesthetic desires and values into the very meaning of what diabetes treatment looks and feels like; and they reproduce the structures of class, race, and gender inequalities that differentiate the lives of diabetics, making some of us more vulnerable to rituals of shame and judgement that get enacted through the powers of surveillance.

As type 1 diabetics, we intimately know what it means and feels like to enact diabetes care as part of the ways we perform ourselves in everyday life. Because we experience our daily lives as monitored performances of chronic disease, we have learned how to conceal and reveal our type 1 diabetes as a set of practices tied to our use of skeuomorphic insulin delivery technologies and blood glucose monitoring, the latter of which we have not analyzed here. By “materializing the metaphor” of insulin delivery as a form of communication, insulin pens and pumps script norms of discreet and successful type 1 diabetes self-management directly into the technologies of insulin delivery and the social rituals we as type 1 diabetics use to dose insulin into our bodies. Moving further and further from the look of the syringe, insulin pens and pumps communicate a different vision of diabetic embodiment modeled on the look, style, and materials of familiar communication technology, right down to the headphone-wearing pumper imagined in the 2012 Bigfoot Biomedical, Inc. patent application for an insulin pump-media player device. The camouflaging of insulin delivery is constructed as

beneficial, even necessary, for diabetics because these technologies shape the boundaries of the successful diabetic subject, displacing the stigma of diabetes, and of the medical technology of syringes, onto others. They present visions of diabetic subjectivity that articulate the use of technologies for concealing diabetes with powerful, and often highly moralized and moralizing notions of diabetic freedom, liberty, and agency. They suggest not so much that diabetes *must* or *should* be made invisible, but that it can, and should, be fashioned to look like something it is not.

By confronting, negotiating, and rejecting the norms of concealment enacted through the skeuomorphic design and performance of diabetic medical technologies, diabetics challenge some of the standards of morality that condition diabetic subjecthood and embodiment. Further research might take up some of these issues to examine how type 1 diabetics develop additional strategies and innovate new practices around their performance of the daily rituals of diabetes self-management. Additional analysis could reveal some more of the nuances in how diabetics model their behavior around the skeuomorphic design of their devices to negotiate the embedded standards of morality that condition diabetic subjecthood and embodiment, particularly online, where type 1 blogs and social media sites provide key archives for examining how diabetics talk about and speak back to these norms and ideals, and construct new ones in their stead.

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Notes

¹ To refer to people living with diabetes, we use both the person-first terminology of a *person* or *people with diabetes* and the term *diabetics*. The International Diabetes Federation, the American Diabetes Association, and the American Medical Association have all established language standards for referring to patients in diabetes care as persons with diabetes. Doing so frames diabetes as a condition a person has, rather than a type of person someone is, avoiding the use of the disease to describe a person's identity (see Broom and Whittaker 2004; Iverson et al. 2007; International Diabetes Federation 2014; American Diabetes Association 2017; Dickinson et al. 2017). Person-first language is less judgmental

and avoids stigmatizing people living with diabetes, centering the person, rather than the disease. We recognize the significance of person-first language, especially in the context of the medical clinic, where language can be used to judge, stigmatize, berate, and exclude people living with disease. Based in our own experiences and the ways we refer to ourselves as both “diabetics” and “people living with diabetes,” we use both terms in this article, in recognition of the choices people living with diabetes make in terms of how they refer to themselves.

² Other insulin pens were also on the market in 1985, including the “Autopen” made by Owen Mumford Limited in the UK, but many—particularly those associated with Novo Nordisk—assert that the NovoPen® was “first.” See Science Museum Group, “Autopen,” insulin injection pen, UK, 1985, object number 1993-932, Science Museum Group Collection Online, accessed October 22, 2020, <https://collection.sciencemuseumgroup.org.uk/objects/co143504/autopen-insulin-injection-pen-united-kingdom-1985-insulin-injecting-device>.

³ Rentschler uses *she/her* pronouns, while Nothwehr uses *they/them* pronouns.

⁴ The authors of this article use both the terminology of *chronic illness* and *chronic disease* to talk about diabetes. Diabetes is not always defined by, or experienced as, illness or a state of being sick, but can also be experienced as a medical condition one has that requires treatment.

⁵ Inventor Dean Kamen (1975b) filed a patent application in 1974 for a Medication Injection Device that “controlled for repetitive delivery, by intravenous injection or otherwise, of predetermined syringe volumes of said medication at present time intervals, wherein the syringe plunger medication injection stroke is achieved using a powering motor, and the control exercised over the mode of operation of the device is related to the rotational traverses of said motor” (1). Prior to his application, two other patents were filed for “automatic injectors”: one for a “motor driven fluid administration device” in 1965 by W.R. Jewett (US patent # 3,456,649) and another for “angiographic injection equipment” in 1966 by Marlin S. Heilman Gibson and Donald Jones (US patent # 3,623,474). Kamen’s 1974 (1975a) patent application for a “control device for a monitor supervising a patient” provided designs for a system that would regulate and monitor the use of automatic syringes, enabling their broader use in medical settings (1). In 1976, Kamen founded AutoSyringe, Inc. to bring designs for the automatic syringe to market. He is credited with designing the first insulin pump (see “Dean Kamen” 2018).

⁶ While *Wired* magazine, where the photo was republished, and the Associated Press both identify that Connolly wore the device in 1986, this is not possible,

because Connolly died in 1984 at the age of forty-one from a heart attack caused by his lifelong diabetes, as reported in the *New York Times* and in a book published posthumously after Connolly's death, titled *Love, Dad* (see *New York Times* 1986). The image of Connolly wearing the automatic syringe also appears on Pinterest and blogs such as *Savvy Diabetic*, reproducing this error. The automatic syringe that is pictured is likely circa 1978.

⁷ Not all pump users talk about wearing their pump technology. While Rentschler refers to wearing her insulin pump, which she clips to a belt or the waistband of her pants, Nothwehr more often refers to using or carrying their pump in their pants pocket.

⁸ Motivated in particular by his son Sam's diabetes needs, Bryan Mazlish describes the mission of Bigfoot Biomedical, Inc. as the automation of the human labor required to manage one's own and other's type 1 diabetes. "In the right circumstances," the company's website explains, "a machine can by and large make better decisions than humans if given the appropriate information and direction." Unlike people, "machines never tire, never get distracted" (see Bigfoot Biomedical, n.d.). Under the moniker of "Bigfoot," Mazlish is known for successfully hacking an insulin pump to work as an automated or "artificial pancreas," a closed-loop system in which data from a continuous glucose monitor is used by an insulin pump's algorithm to make adjustments to insulin dosages. Both his wife and son reportedly use his looped system as type 1 diabetics.

References

Acland, Charles R. 2007. "Introduction: Residual Media." In *Residual Media*, edited by Charles R. Acland, xiii–xxvii. Minneapolis: University of Minnesota Press.

Ahmed, Sara. 2007. *Queer Phenomenology: Orientations, Objects, Others*. Durham, NC: Duke University Press.

———. 2010. *The Promise of Happiness*. Durham, NC: Duke University Press.

Akrich, Madeleine. 1992. "The De-Description of Technological Objects." In *Shaping Technology/Building Society: Studies in Sociotechnical Change*, edited by Wiebe Bijker and John Law, 205–24. Cambridge, MA: MIT Press.

American Diabetes Association. 2017. "Standards of Medical Care in Diabetes." *Diabetes Care* 40 (Suppl. 1): S1–S135.

Archer, Alan. 2014. "Shame and Diabetes Self-Management." *Practical Diabetes* 31, no. 3: 102–06.

Arduser, Lora. 2017. *Living Chronic: Agency and Expertise in the Rhetoric of Diabetes*. Columbus: Ohio State University Press.

Balfe, Myles, Frank Doyle, Diarmuid Smith, Seamus Sreenan, Ruairi Brugha, David Hevey, and Ronan Conroy. 2013. "What's Distressing About Having Type 1 Diabetes?"

A Qualitative Study of Young Adults' Perspectives." *BMC Endocrine Disorders* 13 (25): 1–14. <https://doi.org/10.1186/1472-6823-13-25>.

Balsamo, Anne. 2011. *Designing Culture: The Technological Imagination at Work*. Durham, NC: Duke University Press.

Barad, Karen. 2007. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, NC: Duke University Press.

Bergen, Rachel. 2019. "It Affects Everything!': Manitoba Diabetics Want Province to Expand Insulin Pump Coverage." *CBC News*, December 20, 2019. <https://www.cbc.ca/news/canada/manitoba/diabetes-manitoba-insulin-coverage-1.5399708>.

Biagioli, Mario. 2014. "Intangible Objects: How Patent Law is Redefining Materiality." In *Objects and Materials: A Routledge Companion*, edited by P. Harvey, E.C. Casella, G. Evans, H. Know, C. McLean, E.B. Silva, N. Thoburn, and K. Woodward, 378–90. New York: Routledge.

Bigfoot Biomedical. n.d. "The Legend of Bigfoot." Accessed November 3, 2020. <https://www.bigfootbiomedical.com/about/the-bigfoot-legend>.

Broom, Dorothy, and Andrea Whittaker. 2004. "Controlling Diabetes, Controlling Diabetics: Moral Language in the Management of Diabetes Type 2." *Social Science & Medicine* 58: 2371–82. <https://doi.org/10.1016/j.socscimed.2003.09.002>.

Browne, Jessica L., Adriana Ventura, Kylie Mosely, and Jane Speight. 2014. "'I'm Not a Druggie, I'm Just a Diabetic': A Qualitative Study of Stigma from the Perspective of Adults with Type 1 Diabetes." *BMJ Open*, no. 4, 1–10.

Canadian Diabetes Association. 2013. "Using Insulin." Ontario Ministry of Health and Long-Term Care. http://www.health.gov.on.ca/en/public/programs/diabetes/docs/diabetes_factsheets/English/insulin_diabetes_240314en.pdf

Connolly, Patrick. 1986. *Love, Dad*. Kansas City, MO: Andrews, McMeel & Parker.

Cooperative Patent Classification "A61M." 2020. Alexandria: United States Patent and Trademark Office. <https://www.cooperativepatentclassification.org/cpc/scheme/A/scheme-A61M.pdf>.

Davis, Lennard J. 1995. *Enforcing Normalcy: Disability, Deafness, and the Body*. New York: Verso.

"Dean Kamen, Science Advocate, Inventor and Entrepreneur, To Receive 2018 NSB Public Service Award." 2018. *National Science Foundation*, April 5, 2018. https://www.nsf.gov/news/news_summ.jsp?cntn_id=244962&WT.mc_id=USNSF_62&WT.mc_ev=click.

Diabète Québec. n.d. "What Is an Insulin Pump?" Accessed November 3, 2020. <https://www.diabete.qc.ca/en/living-with-diabetes/care-and-treatment/drugs-and-insulin/insulin-pumps/>.

Diabetes Care Community. 2015. "Insulin Pump Coverage in Canada." 2015. *Diabetes Care Community.ca*, February 11, 2015.

<https://www.diabetescarecommunity.ca/living-well-with-diabetes-articles/medication-articles/insulin-medication-articles/insulin-pump-coverage-in-canada/>.

Diabetes.co.uk. 2011. "Insulin Pens." YouTube video, 0:56. April 19, 2011.

<https://youtu.be/v2nvnlyF-10>.

Diabetes Education Online. n.d. "What Is an Insulin Pump?" Diabetes Teaching Center at the University of California, San Francisco. Accessed November 3, 2020.

<https://dtc.ucsf.edu/types-of-diabetes/type2/treatment-of-type-2-diabetes/medications-and-therapies/type-2-pump-rx/what-is-an-insulin-pump/>.

Diabetes Forecast. 2009. "Insulin Pumps: Some People with Diabetes Use Wearable Pumps to Provide Insulin." January 2009.

<http://www.diabetesforecast.org/2009/jan/insulin-pumps.html>.

Diabetes Forecast. 2019. "Insulin Pens: Consumer Guide." March 2019.

<http://main.diabetes.org/dforg/pdfs/2019/2019-cg-insulin-pens.pdf>.

Dickinson, Jane K., Susan J. Guzman, Melinda D. Maryniuk, Catherine A. O'Brian, Jane K. Kadohiro, Richard A. Jackson, Nancy D'Hondt, Brenda Montgomery, Kelly L. Close, and Martha M. Funnell. 2017. "The Use of Language in Diabetes Care and Education." *Diabetes Care*, no. 40, 1790–99. <https://doi.org/10.2337/dci17-0041>.

Disetronic Medical Systems. 2003. "Product Recall: Urgent Safety Information Concerning Your D-Tron Pump." Letter to D-Tron user(s).

<https://archive.childrenwithdiabetes.com/download/DisetronicDTRONNotice.pdf>.

Forlano, Laura. 2016. "Hacking the Feminist Disabled Body." *Journal of Peer Production*, no. 8. <http://peerproduction.net/issues/issue-8-feminism-and-unhacking-2/peer-reviewed-papers/issue-8-feminism-and-unhackingpeer-reviewed-papers-2hacking-the-feminist-disabled-body/>.

———. 2017. "Data Rituals in Intimate Infrastructures: Crip Time and the Disabled Cyborg Body as an Epistemic Site of Feminist Science." *Catalyst: Feminism, Theory, Technoscience* 3 (2): 1–28. <https://doi.org/10.28968/cftt.v3i2.28843>.

Garland-Thomson, Rosemarie. 1997. *Extraordinary Bodies: Figuring Physical Disability in American Culture and Literature*. New York: Columbia University Press.

Gessler, Nicholas. 1998. "Skeuomorphs and Cultural Algorithms." Paper presented at *Evolutionary Programming VII: Proceedings of the 7th International Conference on Evolutionary Programming*. Berlin, 1998. <https://doi.org/10.1007/BFboo40776>.

Goffman, Erving. 1963. *Stigma: Notes on the Management of Spoiled Identity*. New York: Simon & Schuster, Inc.

Hall, Rachel, Torin Monahan, and Joshua Reeves. 2016. "Editorial: Surveillance and Performance." *Surveillance & Society* 14 (2): 153–67.

<https://doi.org/10.24908/ss.v14i2.6375>.

Hamraie, Aimi, and Kelly Fritsch. 2019. "Crip Technoscience Manifesto." *Catalyst: Feminism, Theory, Technoscience* 5 (1): 1–34. <https://doi.org/10.28968/cftt.v5i1.29607>.

Haraway, Donna. 1992. *The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others*. New York: Routledge.

Hayles, N. Katherine. 1999. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago: University of Chicago Press.

Hendren, Sara. 2020. *What Can a Body Do?: How We Meet the Built World*. New York: Penguin Random House LLC.

Horrocks, Stephen. 2019. "Materializing Datafied Body Doubles: Insulin Pumps, Blood Glucose Testing, and the Production of Usable Bodies." *Catalyst: Feminism, Theory, Technoscience* 5 (1): 1–26. <https://doi.org/10.28968/cftt.v5i1.29613>.

Hurley, Dan. 2014. "Diabetes Patients Are Hacking Their Way Toward a Bionic Pancreas." *Wired.com*, December 24, 2014. <https://www.wired.com/2014/12/diabetes-patients-hacking-together-diy-bionic-pancreases>.

International Diabetes Federation. 2014. "International Diabetes Federation Language Philosophy: Technical Document." Brussels: International Diabetes Federation.

Iverson, Cheryl, Stacy Christiansen, and Annette Flanigan. 2007. *AMA Manual of Style*, 10th ed. Oxford: Oxford University Press.

Jayarag, Kandaswamy, Ellen D. Davis, and Diana McNeill. 2001. "New Therapies for Type 1 Diabetes Mellitus." *Ochsner Journal* 3 (3): 138–43.

Kafer, Alison. 2013. *Feminist, Queer, Crip*. Bloomington: Indiana University Press.

Kamen, Dean. 1975a. Control Device for a Monitor Supervising a Patient. U.S. Patent 3,871,361, filed March 11, 1974, and issued March 18, 1975.

———. 1975b. Medication Injection Device. U.S. Patent 3,858,581, filed July 2, 1973 and issued January 7, 1975.

Latour, Bruno. 1988. "Mixing Humans and Nonhumans Together: The Sociology of a Door-Closer." *Social Problems* 35 (3): 298–310.

Liu, Nancy F., Adam S. Brown, Alexandra E. Folias, Michael F. Younge, Susan J. Guzman, Kelly L. Close, and Richard Wood. 2017. "Stigma in People with Type 1 or Type 2 Diabetes." *Clinical Diabetes*, no. 35, 27–34.

Love, Heather. 2015. "Stigma." In *Keywords for Disability Studies*, edited by Rachel Adams, Benjamin Reiss, and David Serlin, 173–75. New York: New York University Press.

Lucherini, Mark. 2016. "Performing Diabetes: Felt Surveillance and Discreet Self-Management." *Surveillance & Society* 14 (2): 259–76.

McAdams, Brooke H., and Ali A. Rivzi. 2016. "An Overview of Insulin Pumps and Glucose Sensors for the Generalist." *Journal of Clinical Medicine* 5 (1): 1–17. <https://doi.org/10.3390/jcm5010005>.

Medtronic. 2017. *MiniMed 670G System Brochure*. https://www.medtronicdiabetes.com/sites/default/files/library/download-library/references/MiniMed_670G_System_Brochure.pdf.

Mol, Annemarie. 2009. "Living with Diabetes: Care Beyond Choice and Control." *Lancet* 373 (9677): 1756–57. [https://doi.org/10.1016/S0140-6736\(09\)60971-5](https://doi.org/10.1016/S0140-6736(09)60971-5).

Mol, Annemarie, and John Law. 2004. "Embodied Action, Enacted Bodies: The Example of Hypoglycaemia." *Body & Society* 10 (2/3): 43–62.

Morris, Jeremy W. 2015. *Selling Digital Music, Formatting Culture*. Berkeley: University of California Press.

Murphy, Michelle. 2012. *Seizing the Means of Reproduction: Entanglements of Feminism, Health, and Technoscience*. Durham, NC: Duke University Press.

New York Times. 1986. "A Father's Memorial Is His Own Messages of Love." August 23, 1986. <https://www.nytimes.com/1986/08/23/style/a-father-s-memorial-is-his-own-messages-of-love.html>.

Novo Nordisk Pharmaceuticals, Inc. 2002. "Insulin Pump Therapy: Is It Right for You?" December 2002. <http://www.insulin-pumpers.org/faq/novopump.pdf>

Pihlaskari, Andrea K., Barbara J. Anderson, Sahar S. Eshtehardi, Brett M. McKinney, David G. Marrero, Debbie Thompson, and Marisa E. Hilliard. 2020. "Diabetes Disclosure Strategies in Adolescents and Young Adults with Type 1 Diabetes." *Patient Education and Counseling* 103 (1): 208–13. <https://doi.org/10.1016/j.pec.2019.08.019>.

Pottage, Alain. 2011. "Law Machines: Scale Models, Forensic Materiality and the Making of Modern Patent Law." *Social Studies of Science* 41 (5): 621–43.

Pullin, Greg. 2009. *Design Meets Disability*. Cambridge, MA: MIT Press.

Rex, Jørn, and Otto A. Vogeley. 1986. Dispenser. U.S. Patent 4,592,745, filed February 29, 1984, and issued June 3, 1986.

Rex, Jørn, Klaus H. Jensen, and Simon A. Lawton. 2006. "A Review of 20 Years' Experience with the NovoPen Family of Insulin Injection Devices." *Clinical Drug Investigation* 26 (7): 367–401. <https://doi.org/10.2165/00044011-200626070-00001>.

Samuels, Ellen. 2003. "My Body, My Closet: Invisible Disability and the Limits of Coming-Out Discourse." *GLQ* 9 (1/2) 233–55.

Squibb-Novo, Inc. 1986. *State-of-the-Art Diabetes Care*. NovoPen® booklet. Catalog number NMAH-AHB2012q0689, Division of Medicine and Science, National Museum of American History, Smithsonian Institution, Washington, DC.

Squibb-Novo, Inc. 1986a. "Convenient, Discreet, Accurate." In *State-of-the-Art Diabetes Care*. 1986. NovoPen® booklet. Washington, DC: Division of Medicine and

Science, National Museum of American History, Smithsonian Institution. NMAH-AHB2012q06898.

Squibb-Novo, Inc. 1986b. "Discreet, Convenient, Helpful." In *State-of-the-Art Diabetes Care*. 1986. NovoPen® booklet. Washington, DC: Division of Medicine and Science, National Museum of American History, Smithsonian Institution. NMAH-AHB2012q06899.

Star, Susan L. 2010. "This Is Not a Boundary Object: Reflections on the Origin of a Concept." *Science, Technology, and Human Values* 35 (5): 601–17.

Star, Susan L., and James R. Griesemer. 1989. "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39." *Social Studies of Science* 19 (3): 387–420.

Star, Susan L., and Karen Ruhleder. 1996. "Steps Towards an Ecology of Infrastructure: Design and Access for Large Information Spaces." *Information Systems Research* 7 (1): 111–34.

Sterne, Jonathan. 2020. "The Software Passes the Test When the User Fails It: Constructing Digital Models of Analog Signal Processors." In *Testing Hearing*, edited by V. Traczyk, M. Mills, and A. Hui, 159–85. New York: Oxford University Press.

Tandem Diabetes Care, Inc. 2020. "t:slim X2 Insulin Pump"
https://www.tandemdiabetes.com/docs/default-source/product-documents/t-slim-x2-insulin-pump/ml-1007630_a---print-patient-pack-control-iq-canada5874789775426a79a519ff1100a9fd39.pdf?sfvrsn=bdfdo4d7_15

Tzemis, Peter. 2020. "Ranking the Best Insulin Pens: 2020." *CPOE.org*, May 26, 2020. <https://cpoe.org/insulin-pens/>.

Umpierrez, Guillermo E., and David C. Klonoff. 2018. "Diabetes Technology Update: Use of Insulin Pumps and Continuous Glucose Monitoring in the Hospital." *Diabetes Care* 41 (8): 1579–89. <https://doi.org/10.2337/dci18-0002>.

Vitellone, Nicole. 2003. "The Syringe as Prosthetic." *Body & Society* 9 (3): 37–52.

Wendell, Susan. (2001) 2017. "Unhealthy Disabled: Treating Chronic Illnesses as Disabilities." *Hypatia* 16 (4): 17–33. Republished in *The Disability Studies Reader*, 5th ed., edited by Lennard Davis, 160–74. New York, NY: Routledge. Citations refer to the Routledge edition.

Wenger, Mitchell, Mark C. Estes, and Scott Chiang. 2016. Portable Infusion Pump and Media Player. U.S. Patent 9,314,566 B2, filed September 3, 2012 and issued April 19, 2016.

"What Someone is Probably Thinking When They See My Insulin Pump." 2018. Meme. Accessed November 3, 2020. <https://me.me/i/what-someone-is-probably-thinking-when-they-see-my-insulin-22122611>.

Williams, Raymond. 1977. *Marxism and Literature*. Oxford: Oxford University Press.

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