

Thinking about Inking; Medical Alert Tattoos and Practical Implications of Their Use for Providers and Patients

Keywords: Tattoos; Health information; Advance directives; Emergency care; Medical alert

Abstract

Objective: Medical alert tattoos (MATs) are under-recognized and under-studied. The information contained in tattoos may be useful for guiding patient management in emergent presentations such as trauma and critical illness when the patient is unable to communicate. However, use of MATs is fraught with medico-legal complexity as well as reliability and safety concerns. This study aims to examine patterns of use and develop recommendations for patients and providers.

Methods: An online survey was created for health care providers, patients and tattoo artists regarding incidence, background motivation, content of tattoos as well as providers' experience with and recommendations for their use. A literature review was performed to examine the available evidence presented in previously published case reports as well as historical, clinical, and ethical reviews.

Results: Allergies and chronic medical conditions were commonly seen. Of the providers who had encountered a MAT 39% reported that it had influenced patient management. Literature review showed wide heterogeneity in the use of MATs by patients and providers.

Conclusion: Whether or not MATs are a good idea, patients are using them to communicate medical information. Health care providers should be aware of their use and the complex issues around interpreting the information they contain.

Introduction

Tattooing: Tattooing is a popular format for body modification that involves the deposition of pigments into the skin to create permanent markings. Contemporary studies indicate that in the USA and Europe 1/5 to 1/4 of the population has at least one tattoo [1,2]. However, tattooing is far from a new concept. The earliest known tattoo is about 5200 years old [3], and in ancient Egypt tattooing was relatively common practice [4]. In the context of contemporary western society, tattooing was popularized in Britain and America during military campaigns with the prevalence of tattoos reaching as high as 65% in members of the US Navy in World War II [5-8].

Tattoos in Medicine: Tattoos have been used in a variety of ways in medicine. The presence of inked dots and lines over the lower back and spine in a late Neolithic mummy in a pattern corresponding to acupuncture sites has been theorized to indicate a possible therapeutic intent of the tattoos themselves³, and in some parts of contemporary West Africa tattoos are placed on the forehead to treat epilepsy or hands and feet to treat peripheral neuropathy [9].

Tattoos may be used to cover scars or recreate the appearance of normal anatomic structures such as nipple tattoos after mastectomy or corneal iris tattoos in leucomata [10-14]. They may mark the site of a colonoscopic biopsy allowing localization during surgical resection

or the site of radiation therapy to ensure consistent localization [15,16]. Ongoing studies are evaluating color changing tattoos as continuous monitors of blood glucose for diabetics which may facilitate recognition of hypoglycemic events [17].

Tattoos as a media for medical information have been in use for more than half of the last century. Large scale blood type tattoo programs were used in Germany in World War II for service members, and US civilian programs during the cold war resulted in thousands of adults and children receiving blood type tattoos [18]. In the military context medical and identifying tattoos with enlisted person's name, blood type, religion and other information are usually placed on the flank [19]. These are sometimes referred to as "meat tags" as part of their intent is to increase the chance of remains being identified and sent home in the case of death in combat, as the torso is frequently the largest portion of the body left intact after high energy trauma.

The use of medical alert tattoos raises questions of safety, accuracy, social concerns, and ethical/medico legal concerns. While there are several case reports, small survey studies and popular media articles there is need for a broader systematic approach to studying these tattoos and the implications of their use for both patients and medical professionals.

Methods

Review of case reports: A search was performed using the PubMed database with search terms "medical alert tattoo", "medical tattoo", "Do Not Resuscitate (DNR) tattoo", "tattoo" and results filtered for relevance. 14 studies were identified with specific case reports. The results are summarized in Table 1. Popular media articles were not used for case review.

Survey: A survey was created with questions targeted to tattoo artists, health care professionals, and patients with chronic medical conditions with and without medical alert tattoos. Surveys were designed to obtain maximal demographic and content information as well as examine motivations and applications of these tattoos. The tattoo artist survey focused on incidence of medical alert



Table 1: Case Review.

First Author	Year of publication	Patient age/ gender	Site of tattoo	Text in tattoo	Symbols in tattoo	Other notes
Iserson [25]	1992	65M	Lateral to left areola	None	Crossed out defibrillator pad	Quote from patient: "I don't mind dying, but I sure as hell do not want to spend days, months, or years in a nursing home bouncing beach balls in a parachute blanket".
Cooper [65]	2012	59M	Central lower chest/upper abdomen	"D.N.R."	None	Patient admitted for elective BKA, "D.N.R." reviewing code status did want resuscitative measures but not prolonged attempts. Explained that he had lost a bet playing poker with fellow ancillary hospital staffers while inebriated in his younger years. Stated he did not think anyone would take his tattoo seriously and declined tattoo removal
Holt [62]	2017	70M	Across upper chest	"Do not resuscitate [signature]"	None	Ethics committee advised docs to honor tattoo, "suggested that it was most reasonable to infer that the tattoo expressed an authentic preference, that what might be seen as a caution could also be seen as standing on ceremony, and that the law is sometimes not nimble enough to support patient-centered care and respect for patients' best interests" after a DNR order was written, social work dept obtained a copy of his Florida Department of Health "out-of-hospital" DNR order
Lawn [67]	2008	73F	Bilateral upper chest	"No resuscitation No life support"	None	Patient was adamant about not wanting to live in an incapacitated state, to be dependent on others, or be a burden to her son who was her only living relative
Behan [64]	2005	75M	Mid chest	"Do not resuscitate"	None	Patient was widower living alone in isolated rural environment, depressed after bereavement and having angina diagnosed, terrified of possibility of cerebral anoxic brain damage that might follow prolonged cardiac arrest (a particular risk because of his isolated location). After he was successfully treated for angina and found a new partner, and would now like to be resuscitated. Didn't know what to do with his tattoo, no indication in paper that recommendations were given
Kamarainen [60]	2009	Not reported	Left chest	"Organ donation card; I, (name), donate my organs for organ transplantation after death; date; signature"	Outlined to appear like a moderately worn/damaged card	According to the Finnish National Authority for Medicolegal Affairs a tattooed consent is not legally equivalent to a signed document
Nag [68]	2003	21M	Left chest	"Diabetic type 1"	None	Worried about hypoglycemia, particularly others not recognizing symptoms. Did not want to wear bracelet
Aldasouqi [69]	2011	Not reported	Forearm	Diabetic	Red star of life (6 point asterisk) with Rod of Asclepius in center	Patient stated original motivation was cost of bracelets that would wear out after 2-3 years
Chadwick [46]	2013	15M	Forearm	"Diabetic type 1"	None	Multiple previous hypoglycemic episodes. Patient was from UK, went to another country (unnamed) to get tattoo as it was illegal in UK
Colbert [70]	2016	47M	Right wrist	"Malignant Hyperthermia"	6x five point stars	Patient couldn't use bracelets at work as equipment he worked with made it hazardous
O'Niel [71]	2003	51M	Left upper chest	Myocardial Infarction [date] [medical identifying number] [phone number] streptokinase given do not repeat"	None (Text arranged in circle)	Had been told that repeat dose of streptokinase was contraindicated
Barclay [72]	2002	Not reported	Not reported	"ScolineAponea"	None	Misspelled tattoo
Whittaker [73]	2009	25M	Forearm	"8344.MERRF", script text	None	Patient had myoclonic epilepsy, ataxia and ragged red fibers with A>G transition at nucleotide 8344 in mitochondrial DNA. Wanted to raise awareness of disease and felt a feeling of "reclaiming his own body"
Lai [74]	2018	16F	Anterior and posterior forearm	"Myotonia Congenita, [Name], Malignant Hyperthermia, No anectine no succinylcholine"	Red star of life, goat	Patient had expressed an interest in tattoos and mother supported her (being a minor) in getting this specific tattoo

tattoos, content, and technical aspects of tattooing and tattoo aging. The health care professional survey focused on experiences with medical alert tattoos in practice as well as recommendations for use. The patient survey focused on demographic information, medical history as it pertains to tattoo content, text and symbol content of tattoos, tattoo placement, motivations and attitudes about tattoos as well as receptiveness to recommendations. The study and surveys were reviewed and approved by the ethics board of the University College Cork. The survey link was made available on a social media site (Facebook) created for the purpose of this study with study aims, safety and ethical information available. This was distributed through a combination of sharing on other social media sites such as tattoo artist interest groups, various medical groups, and health care associated sites as well as through email between 2014 and 2019. There were zero responses from these methods for the tattoo artist arm so surveys were printed and brought in person to tattoo shops at various locations in the United States of America, Canada, and Ireland. This allowed additional conversation about answers to survey questions as well as various technical explanations of tattoo techniques and limitations. Only two artists refused to complete the survey when approached in person. Overall response rate was not available as it was not possible to accurately quantify total reach given the methods of distribution.

Results

Surveys: Survey respondents numbered 10 for tattoo artists, 14 for patients with medical alert tattoos, 20 for patients with chronic health conditions but no medical alert tattoo, and 54 for health care professionals.

Tattoo artists: 90% of tattoo artists surveyed had done a medical alert tattoo. Artists surveyed had a range of 5-30 years' experience with a mean of 12 years. The number of tattoos done ranged from 0-50 with a mean of 10 and median 9. In terms of technical considerations for tattooing, tattoo artists uniformly advocated simple text relative to any form of cursive or fancy font as having greater longevity. Most artists felt that the size of lettering to have good long-term legibility would be around 1 inch or 2.5 cm although this would vary based on experience and technique (for example, single needle vs multi needle).

Patients with medical alert tattoos: 50% of patients with medical alert tattoos surveyed were between the ages of 26-35. Almost all had gotten their medical tattoo within the 5 years prior to responding to the survey. 93% had previously used other media such as jewelry or cards to keep their medical information on their person. Motivations for getting a medical alert are summarized in the first portion of Table 2. These patients had a range of 1-12 tattoos in total with 40% having only one tattoo (the medical alert tattoo). Of those patients with multiple tattoos, 22% had their medical alert tattoo placed near other tattoos. 93% said that they would have considered following

recommendations on content, design and placement for medical alert tattoos provided by health care professionals if they had been available at the time they got their tattoo.

Patients with chronic health conditions without medical alert tattoos: 50% of patients in this category were between the ages of 36-50. 90% have considered getting a medical alert tattoo. Motivations for considering this option are listed in the second portion of table 3. 90% would consider following recommendations for content, design and placement if such recommendations were available from health care professionals.

Health Care Professionals: 85% of health care professionals surveyed were either paramedics/EMTs or physicians, the remaining 15% identified as nurses, NPs, PAs or other. All respondents were involved in direct patient care. 33% had seen a patient with a medical alert tattoo and of those 39% reported that their treatment of a patient had at some point been influenced by the information in the tattoo. All of these instances were in emergent situations. 83% of those surveyed would support a patient considering a medical alert tattoo and 89% would consider providing recommendations based on health care professional guidance to patients considering a medical alert tattoo.

Content: Content of tattoos is summarized in Table 4. Text content included in the "other" category generally referred to medical history that did not fit into general chronic medical conditions (for example, history of splenectomy, prior administration of streptokinase). Symbols included in the "other" category ranged widely and notably included blue circles and I>^v, (both of which are representative of diabetes) as well as cartoon characters, 5 pointed stars, syringes, skull and crossbones.

Recommendations: Health care providers were asked about their recommendations for content and placement to make medical alert tattoos more recognizable and useful to the patient. Responses are summarized in Table 5.

Discussion

Incidence/Prevalence: The incidence and prevalence of medical alert tattoos is very difficult to estimate. The usual creators of medical alert tattoos, tattoo artists, are theoretically a good source of data but this proved very difficult to obtain. Prevalence estimates are also difficult as there is likely response bias, particularly with social media. However, when searching popular media articles and image search engines it is clear that tattoos are being used by many patients to convey medical information. Given their widespread use by patients it is important that health care professionals are aware of this practice and be trained in their recognition and interpretation in situations where a patient cannot communicate their medical information.

Table 2: Patients with chronic medical conditions with and without medical alert tattoos motivation for getting medical alert tattoos.

Motivation for getting medical alert tattoo: Patients with tattoos	Percent
Cost of medical alert jewellery was too much	50.0%
Jewellery was inconvenient	78.6%
Worried about jewellery being lost or forgotten when an emergency occurs	57.1%
Feeling of mastery or control over your condition	21.4%
Personal art	14.3%
Other	14.3%

Table 3: Patients with chronic medical conditions without medical alert tattoos motivation for considering medical alert tattoos.

Motivation for considering medical alert tattoo	Percent
Cost of medical alert jewelers was too much	15.8%
Jewelry was inconvenient	57.9%
Worried about jewelry being lost or forgotten when an emergency occurs	63.2%
Feeling of mastery or control over your condition	36.8%
Personal art	21.1%
I have not considered a medical alert tattoo	10.5%
Other	5.3%

Table 4: Summary of content found in medical alert tattoos.

Test type	Tattoo artists	Patients
Simple	100%	64%
Cursive/Fancy	0%	36%
Text content		
Name of chronic Condition (e.g. Diabetes)	60%	71.4%
Allergy	30.0%	35.7%
Blood type	20.0%	0.0%
End of life wishes	20.0%	0.0%
Other	30.0%	14.3%
Symbol content		
Star of Life (six-pointed star/asterisk)	10.0%	57.1%
Caduceus (rod with 2 snakes and wings)	30.0%	21.4%
Rod of Asclepius (rod with single snake)	60.0%	50.0%
Other	40.0%	28.6%

Table 5: General recommendations on content and design based on responses from health care professionals.

What information do you think would be useful to include in a medical alert tattoo?	
Patient name	37.0%
Medical information identifying number	9.3%
Allergies	87.0%
Chronic conditions	66.7%
End of life care requests	53.7%
Existence of living will or other document outlining care requests	18.5%
Where to find living will or other document outlining care requests	14.8%
Other	9.3%
What placement do you think would be best for a medical alert tattoo?	
Anterior forearm	53.7%
Poster forearm	9.3%
Lateral arm	3.7%
Medial arm	13.0%
Anterior chest	40.7%
Lateral chest (inferior to axilla)	16.7%
Back	1.9%
Anterior thigh	5.6%
Posterior thigh	0.0%
Lateral leg	1.9%
Medial leg	1.9%
Foot	1.9%
Would a symbol aid recognition and if so what symbol	
I don't think a symbol would help	25.9%
Star of life (six-pointed star/asterisk)	22.2%
Caduceus (rod with wings and two snakes)	20.4%
Rod of Asclepius (rod with one snake)	20.4%
Other (please specify)	11.1%
Would an outline aid in recognition?	
Yes	55.6%
No	44.4%

Content: In terms of tattoo subject matter, both tattoo artists and patients reported chronic medical conditions as the most common content. Allergy was the next most common, followed by other (which included splenectomy and previous administration of streptokinase), blood type, and end of life wishes. The information health care professionals thought would be most useful to include were allergies (87%) and chronic conditions (67%). Just over half (54%) thought end

of life care requests would be useful. Surprisingly, a minority (37%) thought a patient's name would be helpful information and only 9% felt a medical information identifying number would be helpful. In the case of ID numbers, these apply only to the system in which they are assigned and are not linked to the patient universally. Although memberships to services like Medic Alert and various applications connect an ID or a phone to a chart [20], going through the process to access the information takes time. Clear, easily accessible information can make medical alert tattoos valuable in emergent situations where time constraints make it difficult to go searching for a patient's medical information.

Tattooing as a means of recording vaccination status was proposed in 1959 but before recently was not popular [21], possibly because of the high numbers of recommended vaccines in western countries where tattoos are popular. Vaccination status was not seen in medical alert tattoos in this survey; however, it closed before the first COVID-19 vaccine became available. Currently internet searches reveal that many people are getting virus and vaccine themed tattoos both as a general topic and to indicate vaccination status. There are examples of vaccination cards and even QR codes linked to the European "Green Pass" which allows access to public sites/events if the patient's vaccination status is verified through this government regulated system [22].

Text: All tattoo artists surveyed had only put simple text in medical alert tattoos. However, 36% of patients reported using cursive or fancy text in their tattoo. Using complex text can impair legibility, particularly long term as ink bleeds within the skin and may blur irregular edges of fancy text. Tattoo artists universally recommended simple text to optimize long term legibility. Size is also a factor in long term legibility. Artists were asked about the minimum size of text they felt confident would be legible over a long period of time. Larger was better with most people recommending approximately 1 inch or 2.5cm, although several artists noted that this would depend on technique. Namely, single needle technique (not used by all artists) with careful ink deposition would allow smaller text to remain legible for longer. So in addition to a clear font an experienced licensed tattoo artist is important to guiding the minimum size of font to ensure long term legibility if a small tattoo is desired.

Symbology: Symbols are widely used to quickly visually identify information such as hazards, directions, and categories. 74% of health care professionals surveyed felt that they would be more likely to recognize a medical alert tattoo if a medical symbol was included. Symbols can have varied meanings when used in tattoos [23]. Within the context of medical alert tattoos there is wide variation in symbol use but the caduceus, rod of Asclepius, and star of life are seen most frequently. These examples are associated with medicine and para medicine. While these associations are an important aspect of a symbol aiding in recognition, the symbol's popularity is also an important part of its usefulness in this context. One example of the difference between accurate association and recognizability is the blue circle. This symbol is accepted to be a symbol of diabetes by many patients with diabetes as well as diabetes associations [24], but is not widely recognized outside of these communities. Of the health care professionals surveyed in this study, only 9% had previously heard of a blue circle representing diabetes. Similarly I>^v ('I'm greater than my highs and lows') is a popular symbol for diabetes within these patient communities but would be unlikely to

be recognized as medical information in an emergency. Symbols not traditionally associated with medicine may be chosen by patients for artistic or personal reasons, but may be less likely to be recognized by emergency medical providers. Surveyed medical professionals were split between which of three common medical symbols was most recognizable. This may be influenced by type of medical care practiced; pre hospital symbols tend to use the star of life, where the caduceus and rod of Asclepius are seen more often in hospitals and private clinics. Providers might more easily recognize the symbols they see more often in their environment.

The interpretation of symbols alone can also be very problematic. The medical symbols discussed can also be seen in tattoos on people without intent of reference to their health. Caduceus, Rod of Asclepius and Star of Life tattoos are commonly found on health care professionals and even symbols specific for a particular condition can be found on patients without the referenced condition. For example, a parent may have a blue circle for a child with diabetes, or a person may have a colored ribbon for a family member with cancer. One case report above gives an example of a DNR tattoo containing only a crossed out image of an old model of defibrillator pad, which may not be recognizable as such to current providers [25]. While they can aid in recognition, a symbol alone is not sufficient to reliably convey medical information and assumptions should not be made about the patient's health status if they are found to have a symbol associated with a medical condition.

Safety Issues: Tattoos and the process of tattooing are not without risk. Transmission of viruses such as Hepatitis C and HIV by tattooing is well established [23,26]. Although the risk of infectious disease transmission is low with licensed professional tattoo shops, particularly compared to those obtained in prison or by any non-professional tattooists where needles may be shared [23], the risk of any kind of infection is still an important factor to consider.

Under the US Food and Drug Administration tattoo inks fall under the Federal Food, Drug, and Cosmetic Act [27]. The FDA has never approved any ink for injection into the skin (although India ink IS FDA approved for endoscopic submucosal injection) [28], and many pigments used in tattoo inks are not even approved for external skin contact [27]. While recommendations on sterility of tattoo inks are provided by the Council of Europe [29], this regulatory body does not have legal power to enforce these recommendations. One study in Denmark found 10% of unopened stock bottles and 17% of previously used stock bottles were contaminated with pathogenic and non-pathogenic bacteria [30]. An FDA safety update in May 2019 also identified several available inks as contaminated with multiple microorganisms [31].

Because of the artificial coloration in tattooing, benign or malignant skin changes may be harder to identify [32], and the ink itself may actually predispose to pathologic processes. Surveys of tattoo ink contents have revealed Group 1 (carcinogenic to humans) and Group 2B (possibly carcinogenic to humans) compounds which may be present in the ink or produced with UV or laser exposure [29,33]. While multiple cases of skin cancers associated with tattoos have been reported in the literature [33,34], a causative relationship is difficult to establish and at this time occurrence of melanoma on tattoos is considered coincidental [33]. However, inflammatory reactions have been clearly linked to tattoo ink exposure and it is logical that cellular changes associated with chemical exposure may directly or indirectly

lead to malignant degeneration [35]. Additionally, tattoos may make interpreting diagnostic studies for lymphatic spread of malignancy more difficult; in some cases extra cutaneous pigment migration may lead to false positive nodal spread of malignancy on PET [36] or sentinel lymph node biopsies using dyes [37,38].

Exposure to tattoo ink can also trigger initial or recurrent manifestations of underlying inflammatory conditions such as sarcoidosis, various dermatosis, uveitis or severe allergic reactions that may require surgical removal of the pigment [32,39-43]. While red and black inks are most commonly associated with adverse reactions it's difficult to say whether the incidence is relatively higher than other inks as relative frequency of use of different colors is unknown but black and red appear most common anecdotally [41]. One of the most common conditions depicted on medical alert tattoos, diabetes, may lead to complications of healing a tattoo if blood glucose is not well controlled [39].

Temporary medical alert tattoos are commercially available and often targeted to children [44]. These commercial tattoos are usually FDA approved with low incidence of adverse reactions, whereas homemade temporary tattoos such as those made from henna may be associated with severe allergic and other reactions [45]. Safety data for use of tattoo ink in children is not available. Tattoos may become distorted and illegible with growth, making them impractical for children and adolescents. There are also legal age cutoffs for tattooing in many countries and states [46], related both to lack of safety data and the ethical issues with inflicting pain without clear benefit on those under the age of consent.

Social Issues: Despite the increasing prevalence of tattoos in western society, there is still a recognized stigma associated with them in many groups. Historical and contemporary literature has frequently shown a link between tattoos and antisocial behaviors [47-51]. While there does seem to be a link with early age body modification and risk taking behavior, older adult studies may have significant selection bias as they frequently draw their data from criminal or mental health facilities [23,47,52]. In fact, a recent European survey showed that people with body modifications including tattoos and piercings reported higher self-esteem and fewer symptoms of social impairment and sleep disorders than their non-modified control group [53]. A study from the same year reported that 16% of tattooed people surveyed regretted at least 1 tattoo, but the rates of regret were significantly higher in those who were first tattooed before age 21 [54]. Another study from 2012 looked at motivations for wanting tattoos removed and most common reasons were professional (for example rules at work about visible tattoos or applying for a different type of job) or personal (most commonly a change in relationship status with a partner named or depicted in a tattoo) [55]. Regrets about tattoos are very rare in military personnel [23]. In the case of medical alert tattoos, comments by our respondents did not express regret. In fact, in both this study and a prior smaller study on diabetics with medical alert tattoos patients felt encouraged or supported by family and or medical providers with only one example of a negative experience in the smaller study [56].

Motivations: A study by Kluger et al asked 5 diabetic patients about their motivation for getting medical alert tattoos [56]. One reported metal allergy and the rest inconvenience of jewelry. The current study also found that inconvenience and cost of jewelry was also a large contributor to the decision to get a medical alert tattoo, but

also found that personal art and a feeling of mastery over the chronic condition were important motivators for many people. Considering that these non-medical reasons are sometimes motivators for getting medical alert tattoos it is understandable why some patients may not be receptive to recommendations from health care professionals on their use. However, the majority of patients seem to be motivated by practical reasons and based on this study would be receptive to guidance.

Accuracy: In the case studies above there are several examples of errors including simple and identifiable spelling errors as well as inaccuracy of the content to the patients' current clinical situation. Arguably the biggest problem with the information contained in medical alert tattoos is that it is self-reported. As any clinical provider will attest, patient self-reports of their medical history are not infallible. In one study 7% of service members self-reported incorrect blood types or Rh factors on a screening form for a walking blood bank [57]. In the blood type tattooing program during the cold war, the incidence of incorrect tattoos was estimated to be as high as 10% [18]. The consequences of transfusion with incorrectly cross-matched blood may be fatal. The more recent issue of restrictions on people refusing COVID-19 vaccination could conceivably serve as motivation for incorrectly reporting vaccination status through a tattoo. In cases where it is possible to confirm information in medical alert tattoos this should be done, but when that is not possible weighing risks and benefits of acting on this information can be helpful. For example, acting on an incorrect DNR tattoo can have fatal consequences, whereas acting on an allergy tattoo has minimal risk.

DNR tattoos: Under US federal law "an advance directive is defined as: A written instruction such as a living will or durable power of attorney for health care, recognized under state law [...] relating to the provision of health care when the individual is incapacitated." [58]. Depending on state regulations a tattoo may or may not qualify under this definition. In the UK, the requirement for a valid advance directive is that it is in writing, specifies the patients exact wishes and is signed by the patient and a witness [59]. In Finland, according to the National Authority for Medico legal Affairs, a tattooed consent is not legally equivalent to a signed document [60].

A recent article in the Oregon Law Review examined this topic in the context of US law [61]. Two states, Florida and Oregon, require advance directive or Physician Orders for Life Sustaining Treatment (POLST) documents to be printed on specific color paper which more explicitly invalidates tattoos. Some states do recognize advance directive proxies in the form of cards or jewelry, and the author suggests that tattoos could theoretically be used as proxies if approved by a given state. This would be particularly useful in states like Oregon where copies of patients' POLSTs are available online and indication of their existence for a given identified patient could be enough to quickly confirm the patients' wishes and guide management accordingly.

In the absence of clear and specific verbiage in many state laws on this subject, interpretation can be aided by hospital specific ethics consultation. To quote the committee in Holt et al's case study [62], "what might be seen as a caution could also be seen as standing on ceremony, and [...] the law is sometimes not nimble enough to support patient-centered care and respect for patients' best interests". To best interpret the information presented in DNR tattoos, providers must be aware of their local laws and apply them to each individual

clinical circumstance with the patients' best interests at the core of their intent.

Opinion articles have suggested that DNR tattoos should never be considered equivalent of an advance directive [63]. This article also brings up the same issue with an example of a piece of jewelry that simply stated "DNR". In this case the patient presented with need for a laparotomy which was done, and when recovered the patient told providers the DNR referred only to not wanting a prolonged ICU stay. Of the case reports reviewed on DNR tattoos, only 3 of 5 represented confirmed accurate information about the patient's end of life wishes. One did in fact inform provider decision making in the absence of next of kin, and after the patient was made officially DNR but before they expired their paper DNR document was found confirming the information in the tattoo [62]. One of the two that did not represent accurate information was in an elderly male who had previously been DNR but whose health had improved and he changed his legal status [64]. The argument was that tattoos can't be valid because they are not changeable, which is inaccurate; Tattoos can be changed in multiple ways. Complete removal or elaborate cover up of a tattoo particularly one in black ink is time consuming and expensive. However, adding a line crossing words out can be done quickly and often without an appointment. As such simple changes to a tattoo can in some cases be easier than changing a legal document. In this case report it is unclear if any guidance on changing the tattoo was given. In situations like this it is valuable for providers to be aware of options for removing or changing tattoos as patients' medical information changes.

Another example of an inaccurate tattoo is a patient who had the letters "DNR" tattooed on his chest because he lost a bet during a poker game [65]. There are also a few other general media articles on people who have DNR tattoos that are meant for style rather than actually conveying medical information. This further supports that providers need to be wary of the accuracy of these tattoos. In general when people get these tattoos for reasons other than conveying end of life wishes they tend to be relatively simple, small, and very rarely say anything other than the letters DNR. However, there are examples of small simple DNR tattoos being accurate expressions of patient wishes and there are probably examples of complicated tattoos being inaccurate. With any expression of patient wishes there is a duty to confirm them if possible and if only limited information is available, if a provider acts in good faith with the information available there is ethical and legal precedent for taking DNR tattoos into account which can be further guided by consultation with the hospital ethics committee.

Validity can be considered similarly with any nonstandard advance directives- a declaration of wishes is only useful when it can be confidently applied to the clinical situation the patient is in. Arguably one can compare the contents of tattoos to the patient in a moment of lucidity saying exactly what is written in the tattoo. For example, if a patient woke and said "DNR", it would not be appropriate to assume that means they want no interventions. The UK Mental Capacity Act states that a provider should not incur liability for providing treatment in the patient's best interests if they do not know or are not satisfied that a valid and applicable advance decision exists [59]. One must be satisfied that the statement is clear enough to be valid and applicable to the situation, which very often requires further thoughtful investigation even in the case of a patient presenting with an advance directive document. If able to

Table 6: Recommendations.

Category	Recommendation
Contraindications and cautions	Patients below the legal age for tattooing in their area
	Patients who are still growing: growth may distort the tattoo content
	Pregnancy: there is minimal data on the safety of the process in pregnancy
	Unstable skin condition anywhere on the body, Koebner phenomenon, medications particularly those that cause skin side effects, lupus, skin cancer, anything that predisposes to severe infection (Kluger 2015 contraindications for tattooing).
	Scars and stretch marks are not contraindications but may have less than ideal cosmetic result compared to normal skin
Recommendations for Patients	General: tattoos should only be obtained at licensed parlors and observe legal age limits; young patients who are still growing should not get medical alert tattoos even if of legal age as they can become distorted
	Placement: anterior forearm or anterior chest (right vs left side not consistently supported) Content: as specific/clear as possible
	Symbols: generally supported to aid in recognition, the more common the symbol the better (star of life, caduceus or rod of Asclepius reasonable), but cannot rely on symbols for conveying information
	Text: plain font, size approx. 1cm to ensure long term legibility for most tattoo artists but this will depend on their skill and technique
	DNR: know the regulations in your area, include specific wishes, use full words rather than abbreviations, sign/date/witness x 2 if possible, reference to official advance directive documents
Recommendations for Providers (General)	Recognize that patients are using tattoos as means of conveying medical information and clear indications of a medical condition or allergy can be helpful to inform management
	Content should be confirmed by finding an official advanced directive if possible
	Consider the risks vs benefits of acting on the information in a tattoo
Recommendations for Providers (DNR)	Be aware of your local laws and institutional guidance regarding advanced directives
	Consider that this may be a legitimate expression of patient preference about end of life care
	Recognize that there is uncertainty in terms of medicolegal issues but that if you are thoughtful about your interpretation of the DNR and act in good faith there is precedent to support using this information to inform care
	When considering whether a tattoo expresses legitimate patient wishes, more weight should be given to more clear, detailed or specific information, witnesses or other indications of the patient trying to have the tattoo taken seriously
	Thorough consideration of the above will likely preclude use in the immediate emergency setting, but is reasonable and recommended in detailed goals of care discussions

effectively communicate, these patients will often agree to advanced interventions if their counseled that their condition is likely reversible and they have a reasonable chance of recovery. The non-standard formats of living wills and other documents and the difficulties in interpreting and applying what is written has contributed to moving towards more standard advanced directives and proxies as discussed above. Regardless of the format, communication of wishes is only as useful as the content and the applicability of that content to the clinical situation.

Similarly to standardizing paper and electronic advance directives, standardizing medical alert tattoos may also be useful. This could aid in recognition, improve clarity of messages conveyed and as discussed above potentially allow for legal recognition as a proxy to a full advance directive [61]. One article suggested creating flash that can be copyrighted by the American Academy of Hospice and palliative medicine reading as follows: “Consider do not resuscitate: I concur to the guided and educated decision of my medical team for medical futility in my present clinical scenario.” [66]. While it seems this did not come to fruition, the idea of providers partnering with national associations with the guidance of ethical and legal teams is a useful one. Further collaboration on this issue is needed.

Limitations of this study

The population of patients with medical alert tattoos is a difficult one to study. Determining prevalence is difficult as these tattoos are usually done without involvement of the medical system. Incidence is even more difficult to determine as the population controlling the incidence (tattoo artists) exist outside the culture of medical research. Outreach through social media as done in this study and prior smaller studies is problematic in that there is notable response bias [56]; patients with medical alert tattoos likely have more interest in completing a survey on something that relates directly to them, and

patients with chronic medical conditions without medical alert tattoos may be more likely to respond if they are already considering getting one. The technology of tattooing itself is also quite old. While it’s still being done many questions were encountered in the process of this study about newer technologies to store medical information such as microchips. However, similar problems come up where information may be out of date, inaccurate, not recognized or not compatible with locally available technology. Most importantly, the data on this subject overall is not strong enough to definitively say medical alert tattoos can improve outcomes for patients with chronic medical conditions. That kind of certainty with all the possible confounders would likely require a randomized control trial which is not a practical option. We have tried to collect data from patients, artists and medical professionals to guide recommendations. Although we were not able to obtain large sample sizes, to the author’s knowledge this remains the largest study on this topic to date.

Conclusions and Recommendations

The results of our survey support that many medical professionals believe that medical alert tattoos can be an appropriate media for conveying medical information. It is important to note that the appropriateness varies on a case-by-case basis driven by the patient’s medical history and motivations as well as the clinical setting. Based on the current lack of structured guidance on this subject coupled with the already wide use of medical alert tattoos, whether or not medical alert tattoos are a good idea or not is somewhat of a moot point as it is clear patients are going to get them regardless of the presence or absence of guidance. However, as most patients report that they would be receptive and that there seems to be room for optimizing their usefulness, formal recommendations are warranted. As such the following recommendations are proposed for patients and health care providers (Table 6 and Figure 1).

Talk to your health care provider before getting any tattoo. Several medical conditions can increase your risk of serious complications. These include but are not limited to:

- Pregnancy (tattoo ink has not been studied in pregnancy and cannot be considered safe)*
- Infection of the skin at the desired site for the tattoo*
- Moles or other skin problems with potential to develop cancer at the desired site for the tattoo*
- Active flare up of any acute or chronic skin condition*
- Immunosuppression (from a medical condition or medication)
- Allergy to latex, inks, or aftercare products

- HIV/AIDS
- Diabetes
- Heart conditions in general
- Endocarditis (consider prophylactic antibiotics)
- Bleeding disorders
- Sarcoidosis
- Kobner phenomenon
- Dematographism
- Psoriasis
- Systemic Lupus Erythematosus
- Urticaria
- Herpes Simplex
- Lichen Planus
- Other unlisted skin conditions


(* indicates situations where one should never get a tattoo, the others are variable "relative contraindications" and should be discussed in detail with your provider)

Useful references for providers:

De Cuyper C. How to advise a patient who wants a tattoo? Presse Med. 2020 Dec;49(4):104048. doi: 10.1016/j.lpm.2020.104048. Epub 2020 Aug 5. PMID: 32768615.

Eltzweig, B. "Do Not Resuscitate" Tattoos: Adequate Evidence of a Patient's Intent to Die?. Oregon Law Review. 2019 Jun;97(2):

Medical Alert Tattoos



Recommendations for patients from health care providers and researchers

This handout is intended to be reviewed by you and your health care provider together so you can discuss the information in the context of your individual situation. Your health care provider can help you with placement and design as well to optimize its usefulness in an emergency situation.


WARNING: There is no FDA approved tattoo ink, and although the EU GPSD regulates tattoo ink, research on long term safety of tattoo ink is unclear. Tattoo at your own risk. If you choose to get a tattoo, ensure that the artist and studio maintain licensing and certification according to the laws in your area.

Recommendations based on research and surveys of health care providers

Placement: Most providers recommended placement of medical alert tattoos on the forearm (either side) or the chest


Style/Layout: Use only plain text and ensure the text is large enough that it will be visible throughout your lifetime. The size limits will depend on your artist and the method they use, so discuss size with them. An outline around the tattoo may help providers recognize it in an emergency particularly if other tattoos are close to it, but not all providers surveyed thought this would be helpful.

Symbols: Providers were evenly split on what symbol would be the easiest to recognize between a star of life (six pointed asterisk, usually red), caduceus (rod with wings and two snakes), and rod of Asclepius (rod with a single snake). The Caduceus was the most commonly used by patients surveyed, but the star of life is often seen in media articles on medical tattoos where the rod of Asclepius is seen less. We recommend a star of life because it is clear, simple and varies less in appearance when done by different tattoo artists compared to the Caduceus.



DIABETES

INSULIN DEPENDENT
YOURTOWN GENERAL
HOSPITAL ID: 5555555



PENICILLIN ALLERGY

ANAPHYLACTIC REACTION
CARRIES EPIPEN


Content...

Identification: Include any relevant document ID numbers (eg medical ID number, POLST/DNR document number). Consider including your name and date of birth, but most providers did not think this was absolutely necessary and it may put you at risk for compromising your identity in other situations.

Allergies: Include what the allergy is to and what kind of reaction you have to it. For example: "penicillin, anaphylaxis"

Chronic Conditions: Include the name of the condition, and if it is a rare condition or something general providers don't normally deal with include important information you would want them to know. For example: "Addison's Disease: Steroid dependent"

Examples



CONSIDER DO NOT RESUSCITATE

AVOID PROLONGED ARTIFICIAL NUTRITION, CHEST COMPRESSIONS, SHOCKS IF MY IMPAIRED CONDITION IS CONSIDERED IRREVERSIBLE
OREGON POLST AVAILABLE ONLINE: ID NO 5555

Do Not Resuscitate/Advanced Directives: DNR tattoos are not recognized as official advance directives or as proxies. You always need to have an official advance directive. A tattoo can alert providers to the fact that you have an advance directive so include any document ID number. To make your tattoo useful to providers, use careful wording such as "Consider Do Not Resuscitate" (the letters "DNR" are not sufficient) or "Avoid prolonged advanced interventions in the case of medical futility". Have your provider help you come up with a phrase in line with your wishes. Consider signing, dating and getting a witness to sign your tattoo. Physicians should not sign tattoos as they are not officially recognized advance directives. If your wishes change, immediately have your tattoo altered or crossed out by a licensed artist and/or removed at an appropriately credentialed facility

Figure 1: Information Pamphlet for Patients (to be used concurrently with physician guidance).

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