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Improving Organ Utilization to Help Overcome the Tragedies of the Opioid Epidemic

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Abstract

Death rates from drug overdoses have nearly doubled since 2003, with over 47 000 deaths in 2014. This is largely attributable to the opioid epidemic. If the unfortunate deaths of otherwise healthy people have yielded an increase in organ donors, then this might serve as perhaps the only comforting factor among this tragic and unnecessary loss of life. In this viewpoint, we present data from the Organ Procurement and Transplantation Network (OPTN) that show how the greatest relative increases in the mechanism of death among deceased donors from 2003 to 2014 were drug overdoses. Unfortunately, despite the absolute increase in the number of donors who died from a drug overdose, the mean organ yield was significantly lower than in other categories, in part due to concerns about disease transmission. In this paper, we present data on the changes in donation from donors with a drug overdose as a result of the opioid epidemic and discuss the need to educate transplant candidates and their physicians about the low risk of disease transmission compared to the greater risk of dying on a transplant waitlist.

Introduction

The opioid epidemic has led to the tragic loss of life of tens of thousands of people across the United States as a consequence of increases in overdoses of heroin and prescription opiates. Death rates from drug overdoses have nearly doubled since 2003, with over 47 000

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deaths in 2014. More than 70% of deaths from prescription drug overdoses were from opiates, and more than 70% of overdoses were from illicit drugs related to heroin (1). As a result, a number of national and state initiatives to address the prescription opioid and heroin epidemic have been proposed, including expanding access to treat opioid use disorders while encouraging physicians to curtail prescriptions for opiates. These are important initiatives, especially as these deaths often occur in younger, otherwise healthy people. The impact of the drug epidemic on organ donation has not been well studied. If the unfortunate deaths of otherwise healthy people from drug overdoses have subsequently yielded an increase in organ donors, then this might serve as perhaps the only comforting factor among this tragic and unnecessary loss of life.

Methods to Determine Impact of Opioid Epidemic on Organ Donation

We analyzed data from the Organ Procurement and Transplantation Network (OPTN) of all deceased donors providing at least one transplanted organ between January 1, 2003, and December 31, 2014, the time period that has been the focus of the drug overdose epidemic. We determined the mechanism of death based on OPTN coding and focused on deaths due to “drug intoxication,” using the five most other common mechanisms of death (stroke, blunt injury, cardiovascular disease, gunshot wound, and asphyxiation which, combined with overdoses, comprise 92.4% of all deceased donors) as the comparator groups.

Overall impact of the opioid epidemic on organ donation

From 2003 to 2014, the greatest relative increases in the mechanism of death among organ donors were due to drug overdoses, with a 350% relative increase between 2003 ($n = 138$) and 2014 ($n = 625$). In 2003, only 2.2% of all deceased donors succumbed from a drug overdose compared to 7.3% in 2014. In the cohort of deceased donors younger than 40 years of age, the percentage of drug overdoses increased from 3.6% to 11.7% between 2003 and 2014.

Geographic differences in organ donation and deaths from drug overdoses

The impact of organ donation from drug overdose was identified in every transplant region in the United States (OPTN region). However, the increases were most notable in OPTN regions 2 (southern New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, and Washington, DC) and 10 (Michigan, Indiana, and Ohio). These increases in donors correlated with population-level data—regions 2 and 10 had the second and third highest number of deaths, respectively, from drug overdoses in 2014 (Figures 1A–D, Figures 2A–D) (2).

Characteristics of deceased donors who died from a drug overdose

Compared to the other most common causes of death in deceased donors, those who died from a drug overdose were more likely to be Caucasian (86.3% vs. 56.3–72.3% for the other five categories) and younger (median age: 31; $p < 0.001$) than donors who died from cardiovascular disease (median: 47) and stroke (median: 52), which mirrors the demographics of the population who are not organ donors dying from drug overdoses. The influence of the drug overdose epidemic on organ donation was most pronounced in the field

of liver transplantation. From 2003 to 2014, the absolute number of deceased-donor liver transplants increased by 1000; nearly 40% of this increase was attributable to donors who died from a drug overdose (103 in 2003 vs. 490 in 2014; Figure 3A). The donor livers attributable to a drug overdose, based on objective parameters of liver quality, were significantly better and associated with longer graft survival (median donor risk index [DRI] of livers from drug overdose donors: 1.21, 95% confidence interval [CI]: 1.12–1.36 vs. 1.52, 95% CI: 1.29–1.74 for livers from donors who died from cardiovascular disease; $p < 0.001$).

Organ yield for donors who died from a drug overdose and categorization as Public Health Service (PHS) “increased risk”

The tragic loss of life from drug overdose deaths can be mitigated in part by saving lives via organ donation, bringing some small measure of comfort to the families of the donors. Unfortunately, these donors are not fully utilized by the transplant community. Donors who died from a drug overdose have the highest overall donation rates (defined as one or more organ[s] donated from a deceased donor 70 years of age and no medical comorbidities that would contraindicate donation, defined as an “eligible death”): 83.4% (drug overdose), 79.7% (gunshot wound), 78.3% (asphyxiation), 76.4% (blunt injury), 68.1% (stroke), 65.3% (cardiovascular disease). Yet despite this, the mean number of organs transplanted per donor was significantly lower for donors who died from a drug overdose ($p < 0.001$) compared to donors who died from a gunshot wound, asphyxiation and blunt injury (donors of similar age distribution and expected to have relatively similar organ yields): drug overdose— 2.3 ± 1.3 , asphyxiation— 2.6 ± 1.4 , blunt injury— 2.8 ± 1.5 , gunshot wound— 3.3 ± 1.6 . This lower yield of lifesaving organs from these donors only compounds the tragedy of the opioid epidemic and was stable during the study period. There are many reasons why these organs are underutilized, including concerns about ischemic damage incurred by donor organs and transmission of infections—namely, hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). However, data suggest that a major driving factor for the underuse of organs from donors who died from a drug overdose is the concern of disease transmission (3). This is highlighted by the increased number of donors labeled “increased risk,” which has grown rapidly since 2011 (Figure 3B). By 2014, 65.0% of donors who died from a drug overdose were labeled as “increased risk” compared to only 12–28% among donors with common mechanisms of death ($p < 0.001$).

Putting risks of disease transmission from PHS increased risk donors in perspective

Importantly, the “increased risk” designation only classifies a donor as having an augmented risk of HBV, HCV and/or HIV transmission based on prespecified risk factors, and in reality, organ transplantation even from this donor cohort is rarely, if ever, associated with disease transmission (4–6). This may reflect more widespread use of nucleic acid testing (NAT), which has decreased the window period for detection of new infection to 7 days. Current predonation testing strategies yield risks of only 2.7 and 10.5 cases of missed HIV and HCV diagnoses per 100 000 person-years of recipient follow-up, respectively (4). The risk of dying on the waitlist for a transplant far exceeds the disease transmission risk of accepting an organ from a screened PHS increased risk donor, and thus theoretical concerns about transmission of HBV, HCV and/or HIV are not well supported by data. Additionally, even when the NAT is falsely negative for these infections, transmission rates are not 100%. For

example, there was a cluster of three “increased risk” donors whose NAT was negative who were subsequently found to have detectable HCV RNA, yet only 6/12 recipients of organs from these three donors developed *de novo* HCV (two additional patients had preexisting HCV) (7).

Physicians and patients vary in their willingness to transplant and/or accept organs from these donors because of fears related to disease transmission. Physician behavior and patient education must be aligned with evidence-based data on the risk of transmission in order to optimally utilize these lifesaving organs. It is likely that individuals succumbing to overdose could be a safer source of organs than some current organ donors, who may be of advanced age with attendant comorbidities such as occult cancer, especially in light of exceedingly rare disease transmission from NAT-negative donors. In fact, in 2013, there were only two reported cases of HBV transmission through organ donation, which led to zero deaths, as opposed to eight cases of cancer transmission (melanoma, adenocarcinoma and “other cancer”), resulting in two deaths (5). To further put things into perspective, there are 22 000–25 000 deceased-donor organ transplants in the United States each year from donors who test negative for HBV, HCV, and/or HIV but only two to four cases of unintentional HBV, HCV, and/or HIV transmission (the OPTN only collects HBV, HCV, and/or HIV data on actual donors from whom at least one organ transplanted; thus, we could not determine the prevalence of these diseases in potential donors identified by organ procurement organizations) (4–6). In contrast, from 2010 to 2014, there were 1812 deceased donors who had died from a drug overdose who were under age 40 (widely considered the “ideal” age for an organ donor) who donated at least one organ, yet organ discards—2980 lungs, 2075 kidneys, 1069 hearts and 382 livers—were commonplace. The reasons for these discards are multifactorial, but data suggest that at least a subset were due to physician and/or patient concerns about disease transmission (3). For example, if only 25% of these discarded organs were from donors under age 40 who died from a drug overdose, there could have been more than 13 000 additional graft-years from these discarded organs (based on the median graft survival during the study period), including 3948.5 graft-years from lung transplants (8), 5187.5 graft-years from kidney transplants (9), 3100.1 graft-years from heart transplants (10) and 1146 graft-years from liver transplants (11).

Conclusion

The best response to the opioid epidemic is to improve systems of care, control prescription drug availability and improve access to drug dependency treatment. However, ignoring the impact of this epidemic on the field of transplantation would be similar to ignoring the impact of other public health threats such as gun violence or trauma on the supply of transplantable organs; society strives to minimize such tragedies. Ultimately, solutions for the crisis in opioid abuse that lead to fewer deaths among patients with drug overdoses will deepen an ongoing crisis in organ supply and will lead to longer waiting times for organ transplantation with a 20 list that now exceeds 100 000 in the United States (OPTN data do not specify what drug led to the overdose, but more than 70% of all US deaths from drug overdoses are related to prescription opioids and/or heroin (1)). As we address these two public health issues, we must continue to focus on systems to optimally use the potential organ supply. Even though donation rates from donors who died from a drug overdose are

greater than for other mechanisms of donor death, the overall number of organs transplanted from these donors is lower. Because data demonstrate that a major driving factor is concerns about disease transmission, it is imperative to educate transplant candidates and their physicians about the low risk of disease transmission compared to the greater risk of dying on a transplant waitlist. Other efforts could include greater efforts to utilize organs from donation after cardiac death (DCD) donors and consideration of imminent death donation to offer families another approach to donation that is more assured with less uncertainty than the typical DCD process—many hurdles must be overcome to make such an approach feasible. Aligning efforts to improve the efficiency of organ utilization will help save hundreds of additional lives each year and potentially bring some small measure of comfort to the families and loved ones ensnared by the opioid epidemic.

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Abbreviations

DCD	donation after cardiac death
DRI	donor risk index
HBV	hepatitis B virus
HCV	hepatitis C virus
HIV	human immunodeficiency virus
NAT	nucleic acid testing
OPTN	Organ Procurement and Transplantation Network
PHS	Public Health Service

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Figure 1. Number of organ donors in the United States who died from a drug overdose in (A) 2003, (B) 2007, (C) 2010, and (D) 2014. Numbers in figure represent the OPTN/UNOS region. OPTN, Organ Procurement and Transplantation Network; UNOS, United Network for Organ Sharing.

Figure 2. Number of deaths from a drug overdose in the United States in (A) 2003, (B) 2007, (C) 2010, and (D) 2014. Numbers in figure represent the OPTN/UNOS region. Data based on Centers for Disease Control and Prevention, National Center for Health Statistics, Compressed Mortality File 1999–2014 on CDC WONDER Online Database, released December 2015 (2). OPTN, Organ Procurement and Transplantation Network; UNOS, United Network for Organ Sharing; CDC, Centers for Disease Control and Prevention.

Figure 3.

(A) Mechanism of death for deceased liver donors in the United States from 2003 to 2014.

(B) Percentage of organ donors classified as "increased risk" based on mechanism of death.