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# Serial Murder by Healthcare Professionals

**ABSTRACT:** The prosecution of Charles Cullen, a nurse who killed at least 40 patients over a 16-year period, highlights the need to better understand the phenomenon of serial murder by healthcare professionals. The authors conducted a LexisNexis® search which yielded 90 criminal prosecutions of healthcare providers that met inclusion criteria for serial murder of patients. In addition we reviewed epidemiologic studies, toxicology evidence, and court transcripts, to provide data on healthcare professionals who have been prosecuted between 1970 and 2006. Fifty-four of the 90 have been convicted; 45 for serial murder, four for attempted murder, and five pled guilty to lesser charges. Twenty-four more have been indicted and are either awaiting trial or the outcome has not been published. The other 12 prosecutions had a variety of legal outcomes. Injection was the main method used by healthcare killers followed by suffocation, poisoning, and tampering with equipment. Prosecutions were reported from 20 countries with 40% taking place in the United States. Nursing personnel comprised 86% of the healthcare providers prosecuted; physicians 12%, and 2% were allied health professionals. The number of patient deaths that resulted in a murder conviction is 317 and the number of suspicious patient deaths attributed to the 54 convicted caregivers is 2113. These numbers are disturbing and demand that systemic changes in tracking adverse patient incidents associated with presence of a specific healthcare provider be implemented. Hiring practices must shift away from preventing wrongful discharge or denial of employment lawsuits to protecting patients from employees who kill.

**KEYWORDS:** forensic science, serial murder, homicide, assault, healthcare professionals, epidemics, nurse, murder

Serial murder by healthcare professionals is a poorly understood but increasingly identified phenomenon (1). The highly publicized cases of Harold Shipman (2,3) the British physician labeled "the most prolific serial killer in the history of the United Kingdom—and probably the world." ((2), p. 1843) after 218 patient deaths were attributed to his lethal administration of Diamorphine (diacetylmorphine), and Charles Cullen (4), a registered nurse (RN) who confessed to killing at least 40 patients in nine hospitals and one nursing home over a 16-year period in two different States, raise many questions about how some of these murderers could get away with killing patients for so long.

The literature to date includes five epidemiologic studies used in the prosecution of nurses for serial murder (5–9), and editorials in the *New England Journal of Medicine* (10) and the *British Medical Journal* (2,11) that address the shock experienced by the healthcare profession when a colleague is convicted of serial murder of patients. Articles by Yorker (12–14), Forrest (15), Beine (16), and Stark (17,18) have identified some common themes in the cases of serial murder by healthcare providers. For example, an investigation often begins when a cluster of cardiopulmonary arrests and/or deaths occurs in a particular patient population. In some cases, suspicions are aroused because patients suffer multiple cardiopulmonary arrests and the resuscitation rate is unusually high. The typical scenario in the cases in the literature involves presence of a common injectable substance in postmortem, or postevent toxicology screens, deaths that cluster on the evening or night shift, and epidemiologic studies linking presence of a specific care provider to increased likelihood of death (15,19). Forrest coined the term caregiver associated serial killings (CASKs) to label the phenomenon (15).

This review of 90 prosecutions is based on the first four author's personal experience with some of the cases and their shared view that data about this phenomenon needs to be disseminated to heighten awareness that serial murder of patients is a significant concern that extends beyond a few shocking, isolated incidents. In addition, we promote strategies for early detection, successful prosecution, and prevention of these crimes that undermine the public's confidence in the safety of healthcare.

## Methods

The authors conducted a LexisNexis® (New York, NY) search to compile a list of healthcare professionals formally charged with murder of patients in their care. LexisNexis® is an advanced legal library database with access to news media and case law. When available, we also reviewed court transcripts, depositions, audio and video tapes, pleadings, toxicology evidence, and government documents.

Initial searches of the database resulted in 147 cases of healthcare providers charged with murder. We excluded: (A) murders committed by healthcare providers outside of the caregiver/patient relationship, e.g., domestic violence, date rape/murder, or associated with motives of revenge, jealousy, or self-defense; (B) murder outside a healthcare setting with firearms, bludgeoning, or other violent means; (C) single murders of patients committed by healthcare providers in a healthcare setting; (D) instances of assisted suicide, such as Dr. Jack Kervorkian who was charged with murder or manslaughter on multiple occasions for killing patients who had provided full informed consent for life termination; and (E) the occasional physician or nurse who is charged with euthanasia for administering lethal amounts of narcotic analgesics to a

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terminally ill patient deemed to be suffering intractable pain. We excluded the recent investigations regarding deaths of hospital and nursing home patients in the wake of Hurricane Katrina as the healthcare providers involved were operating under extraordinary circumstances outside the realm of every day healthcare decision making.

We did however include some cases in which the convicted healthcare provider claimed to be engaged in euthanasia as a defense against murder charges. To differentiate between *authentic euthanasia* and *serial murder*, we correlated the provider's justification of their actions as euthanasia with patient histories. If a caregiver claimed he/or she was engaging in euthanasia, but the victims had been admitted for routine procedures (e.g., biopsy, immunizations, minor injuries, etc.) and postmortem examinations indicated they died from toxic levels of an unauthorized medication, we considered it a case of murder. For example, Charles Cullen initially stated that he was only killing very sick patients to alleviate pain and suffering (4), however, when the medical records of his victims were reviewed, it became apparent that patients who were lethally injected with digoxin were not necessarily terminally ill—e.g., one of his victims was in the hospital recovering from a choking episode. Similarly, Stephan Letter claimed to be sparing patients from senseless suffering, however he allegedly injected a 22-year-old German soldier hospitalized after a minor injury. Fortunately, she only lost consciousness briefly and recovered (20). Several victims of other healthcare providers in this study were killed shortly before being discharged to home or transferred to another care unit (16).

The data presented is limited to those prosecutions of healthcare professionals that fit the literature on serial murder in healthcare, specifically, those cases that linked clusters of suspicious cardiopulmonary arrests and deaths in a patient population to presence of a specific care provider. The total number of healthcare providers who met inclusion criteria of formal legal prosecution for serial murder of patients in their care is 90. We analyzed the data according to geographic location, healthcare provider type, gender, healthcare setting, method of murder, number of patients involved, and outcome of legal proceedings. Some caregivers qualified for more than one category (e.g., geographic location, method and healthcare setting), increasing the numbers to greater than 90 on some variables. Names of healthcare providers are included for most of the prosecutions because they were obtained from documents in the public domain. Some demographic data is missing from the published accounts of prosecutions.

## Results

### *Legal Outcomes*

Forty-five of the 90 healthcare providers were convicted for serial murder (Table 1) four were convicted for attempted murder/assault (Table 2), and five pled guilty to lesser charges (Table 3) totaling 54 convictions. Twenty-four more have been indicted for serial murder and are either awaiting trial or the outcome of the investigation has not been published (Table 4). Another eight were charged with serial murder, however there was insufficient evidence to convict (Table 5). In three of those cases, civil suits resulted in payments of $8 million, $450,000 and $27 million for wrongful death of multiple patients. Four more nurses successfully appealed their convictions for serial murder (Table 6).

TABLE 1—*Convicted for serial murder of patients.*

| | Town, Country | Area of Work/Method | Year | Charges, Conviction, #Suspicious Deaths |
|---|---|---|---|---|
| *Europe nurses/aids* | | | | |
| 1. Rudi Paul Zimmerman | Noordrijn, Wuppertal, Germany | Nurse, hospital and nursing home Elderly | 1971–1976 | Convicted for 3 murders, 4 attempts and serious abuse. Life sentence |
| 2. Frans H. | Kerkrade, Holland | Nurse, Psych-geriatrics | 1972–1976 | Convicted for 5 murders, 259 susp. deaths, confessed, 2 life sentences |
| 3. Reinhard Böse | Rheinfelden, Germany | Nurse, ICU. Hosp. | 1975–1981 | Convicted of 7 murders, sentenced to 7 years |
| 4. Cecile Bombeek | Wetteren Belgium | Nurse/Nun Hosp. | 1977 | Convicted for murder 3+pts.15 suspected. After conviction immediately admitted in psych hosp. |
| 5. Arnfinn N. Nesset | Trontheim, Norway | Nurse, Nsg. home succinylcholine | 1977–1981 | Convicted of 22 murders, 138 suspected, sentenced to 21 years |
| 6. Waltraud Wagner, co-defendant of colleague | Lainz, Vienna Austria | Aide, hospital Rohypnol Water in lungs | 1983–1991 | Convicted of 15 murders, 17 attempts. murd. 135 susp. murders. Life sentence, confessed |
| 7. Irene Leidolf (Ilene) co-defendant of colleague | Lainz, Vienna Austria | Aide, hospital Rohypnol Water in lungs | 1983–1991 | Charged with 4 murders, 2 accomplice to murder charges, suspected of at least 65 murders. Convicted of 5 murders, confessed, life sentence |
| 8. Michaela Roeder | Wuppertal, W. Germany | Nurse, ICU. Hosp. KCl | 1985–1989 | Convicted of 5 murders, 1 attempt. murd Confessed. 11 years sentence |
| 9. Wolfgang Lange | Gutersloh, Germany | Nurse, hosp. Neuro psychiatry Air embolus | 1990–1993 | 14 susp. murd. Convicted of 9 murders, 15 years sentence |
| 10. Beverley Allitt | Grantham, England | Nurse, peds, hosp. KCl Insulin Suff. Air embolus | 1991–1993 | Convicted of 4 murders, 3 attempted murders, 6 assaults, 13 life sentences |
| 11. Female aide | Keulen, Germany | Aide, home | 1993–1998 | Convicted of 6 murders, Life sentence |
| 12. Martha U. | Delfzijl, Holland | Practical nurse, Nursing home | 1996 | Charged and convicted of 4 murders. Sentenced to 4 years,+Psychiatric treatment. Suspected of 5 murders |
| 13. Lucia de Berk | The Hague, Holland | Nurse, peds & adult floor, hosp. ICU Morphine/digoxin | 1997–2002 | Convicted of 7 murders, 3 attempted murders. 7 suspected murders, 2 suspected attempted murders. Life sentence |
| 14. Christine Malevre | Versailles, France | Nurse, neurology. Hosp. KCl, morphine | 1998 | Charged with 7 murders, convicted of 6 murders. 24 suspected murders. 12 years sentence |
| 15. Barbara Patricia Salisbury | Crewe, England | Nurse, geriatrics, floor, hosp. Morphine, suffocation | 1999–2004 | Charged with 2 murders, 2 attempted murders. Convicted of 2 attempted murders, 5 years sentence. Conviction upheld on appeal |

TABLE 1— *Continued.*

| | Town, Country | Area of Work/Method | Year | Charges, Conviction, #Suspicious Deaths |
|---|---|---|---|---|
| 16. Roger Andermatt | Lucerne, Switzerland | Nurse, nsg. home Suffocation/meds | 2001 | Charged with 22 murders, 5 attempted murders, confessed. Convicted. Life sentence |
| 17. Timea Faludi, | Budapest, Hungary | Nurse, hosp. terminally ill unit Morphine/drugs | 2001 | Charged with 7 murders, 37 susp. Murd. Confessed, 11 years sentence |
| 18. Olaf Dater | Bremerhaven, Germany | Nurse, private care | 2001 | Charged w/5 murders, 1 attempted murder. Confessed. Convicted. Life sentence |
| 19. Michaele G. | Wachtberg, Germany | Practical nurse, Nursing home suffocation | 2003 | Convicted of 4 murders, 4 manslaughters, 1 killing on demand. Life sentence |
| 20. Benjamin Geen | Banbury, England | Nurse/ER. Hosp. "unexplained respiratory problems" | 2004 | Sentenced on 2 counts of murder, and 15 counts of causing grievous bodily harm |
| *Europe physicians* | | | | |
| 21. Harold Shipman | Hyde, England | Physician, hosp, own practice, Nsg home, morphine | 1974–2001 | Convicted of 15 murders. 218+susp. murders. Life sentence. Hangs himself in prison 2004 |
| *United States nurses/aids* | | | | |
| 22. Genene Jones | Kerrville, TX, U.S.A. | Practical nurse, hosp. ICU, out pt. Anectine, coumadin | 1981–1984 | Charged with 1 murder, 6 attempted murder. 27 susp. Convicted of 1 murder & 1 assault. Sentenced to 159 years |
| 23. David Richard Diaz | CA, U.S.A. | Nurse, ICU, hosp. lidocaine | 1981 | Convicted of 12 murders 27 susp. murd. Death penalty |
| 24. Bobbie Sue Terrell | Woodlawn, Illinois & FL, U.S.A. | Nurse, Nsg. Home. Insulin, suffocation. | 1984–1985 | Charged with 4 murders, 12 suspected murders, Confessed. Sentenced to 65 years |
| 25. Otha Harrison Hart | Eugene OR, U.S.A. | Nurse, geriatrics Insulin | 1984 | Charged & convicted of 4 murders. 20 years per conviction |
| 26. Randy Powers | CA, U.S.A. | Aide, hosp. Lidocaine | 1984 | Convicted of 1 murder. 12 suspected murders |
| 27. Gwendolyn Gail Graham, co-defendant of C.M. Wood | Grand Rapids, MI, U.S.A. | Aide, Nursing home. Suffocation | 1986–1988 | Convicted of 5 murders, 1 conspiracy to murder, Life |
| 28. Catherine May Wood, co-defendant of G.G. Graham | Grand Rapids, MI, U.S.A. | Aide Nursing home. Suffocation | 1986–1988 | Pled guilty to 6 susp. Murders. Convicted, sentenced to 20–40 years |
| 29. Donald Harvey | Cincinnati, OH, U.S.A. | Aide, Hosp. Insulin, cyanide, suffocation, equip. | 1987 | Pled guilty to 24 murders, admitted to 74 murders. Convicted 3 life sentences |
| 30. Richard Angelo | West Islip, Long Island, NY, U.S.A. | Nurse, ICU. Hosp. Pavulon | 1987–1989 | Convicted of 4 murders, 7 susp. murders, 3 susp. attempt. murd., 50 years sent., confessed |
| 31. Charles Cullen | New Jersey, PA, U.S.A. | Nurse, ICU, hosp. nsg. home Digoxin | 1987–2003 | Charged with murd., 2 attempted murd. 40 suspected murders. Confessed to 13. Sentenced to 11 life sentences |
| 32. Jeffrey Feltner | FL, U.S.A. | Aide, Nursing home Suffocation | 1990 | Pled guilty to 6 murders. Convicted. Life sentence |
| 33. Brian Kevin Rosenfeld | FL, Largo U.S.A. | Nurse, Nsg. home, Mellaril | 1991–1992 | Pled guilty to 3 murders, 23 susp. murders. Confessed. Life sentence |
| 34. Joseph Dewey Akin | AL, U.S.A. | Nurse, hosp. Float Epinephrine, KCl | 1992–1997 | Convicted 1murd. 100 susp. murders, 20 susp. attempt. murders. Life |
| 35. Orville Lynn Majors | Clinton, IN, U.S.A. | Practical nurse, ICU, floor, KCl | 1993–1999 | Charged with 7 murders, 124 susp. Convicted of 6 murders, 360 years |
| 36. Aleata Beach | OK, U.S.A. | Practical nurse hospital | 1994 | Charged for 4 murders, confessed. Sentence unknown |
| 37. Kristen Gilbert | Northampton, MA, U.S.A. | Nurse, ICU. Hosp. VA Epinephrine | 1995–1996 | Charged with 4 murd., 1 manslaughter, and 2 attempts. murd., 37 susp. murd. Convicted of 4 murders, 2 life sent. Life sentence |
| 38. Susan Hey | Austin, TX, U.S.A. | Nurse/hospital KCl | 1997 | Convicted 2 susp. murders, confessed, 2 terms of 50 years |
| 39. Jeanine Hannah/Miata | TX, U.S.A. | Home health care aide, Insulin | 2000–2005 | Charged & convicted of 1 count of murder & 1 count of injury. Suspected in one additional case. Sentenced to 99 years |
| 40. Vickie Dawn Jackson | TX, U.S.A. | Vocational nurse, VA Hosp. Mivacron | | Pled no contest to 10 murders. 23 susp. murders |
| *United States physicians* | | | | |
| 41. Joseph Michael Swango | Illinois, NY, U.S.A. Zimbabwe | Physician, hosp, home KCl | 1970 2000 | Charged with 5 murders, indicted for 1 murder, 1 attempt., 126 susp. deaths in several countries. Confessed 2 life sentences |
| *United States respiratory therapist* | | | | |
| 42. Efren Saldivar | Glendale, CA, U.S.A. | Resp. therapist Hosp. Pavulon, morphine | 1989 1998 | Pled guilty of 6 murd. 165 susp. murd. 1suspected attempt. murd. Convicted. Six life sentences+15 years |
| *Other countries nurses* | | | | |
| 43. Aida Noureddin Mohammed Abu Zeid | Alexandria, Egypt | Nurse, neuro. Surg. ICU hosp. Resp. paralyzing agent | 1998 | Convicted of 1 murder, 29 attempted murders, Sentence reduced to 1 manslaughter and 13 unintentional injuries. 10 years hard labor |
| 44. Edson Isidora Guimaraes | Rio de Janeriro, Brazil | Aide, ICU. Hosp. | 1999 | Charged w/4 murders, 127 suspected murders. Confessed. Convicted 76 years |
| 45. Daisuke Mori | Sendai, Japan | Practical nurse, hosp. muscle relaxant | 2001 | Charged with 1 murder. 4 attempt murd. 20 susp. deaths Confessed. Life sentence |

TABLE 2—*Charged with serial murder, convicted of attempted murder or assault.*

| | | | | |
|---|---|---|---|---|
| 1. Maria Gruber co-defendant of colleague | Lainz, Vienna Austria | Aide, hospital meds, suffocation | 1983–1991 | Charged with 2 murders, convicted of 2 attempted murders, 15 years sentence |
| 2. Stephanie Maier (Stephanija) co-defendant of colleague | Lainz, Vienna Austria | Aide, hospital meds suffocation | 1983–1991 | Charged with 12 murders, 24 accomplice to murder. Convicted of 7 attempts. Confessed. 20 years sentence |
| 3. Terri Rachals | Albany, GA, U.S.A. | Nurse, ICU. Hosp. KCL | 1985–1986 | Charged with 6 murd. 20 assault. 10 susp. murd. Convicted for 1 assault, guilty but mentally ill, served 17 years, released 2002 |
| 4. Phillip Reed | Leeds, England | Nurse, hosp. nsg. home, morphine | 1999–2000 | Charged with 2 murders, 2 poisonings, and 4 charges mistreating patients. Convicted 4 years for assault |

*Cases Each Decade Since 1970*

Ten CASKs took place during the 1970s, 21 during the 1980s, 23 during the 1990s, and 40 since 2000 (four of these spanned more than one decade). The number of new investigations in the United States has slowed somewhat (two in the 1970s, 12 in the 1980s, 11 in the 1990s, and 10 between 2000 and 2006) while 30 of the investigations since 2000 occurred in other countries.

*Geographic Location*

The United States conducted 36 prosecutions, or 40%. Twenty-two states have prosecuted cases, with Texas, Michigan, California, Florida, and Indiana having three or more. Twenty-one countries have prosecuted caregivers for serial murder of patients with Germany (14 cases) and England/Wales (12 cases) experiencing the highest number of cases (Fig. 1). It is noteworthy that the vast majority of prosecutions to date have occurred in countries with technologically advanced healthcare. Some caregivers account for more than one geographic location, e.g., Charles Cullen was investigated in Pennsylvania and New Jersey, and Joseph Michael Swango, a physician, was investigated and prosecuted for murders and poisonings in New York, Illinois, then Zimbabwe before finally being sentenced to life in prison (21).

*Profession*

Nursing personnel comprise the overwhelming majority (86%) of serial healthcare killers (Fig. 2). RNs were the most frequent type of healthcare professional involved, accounting for 54 of the 90 prosecutions. Seven were either Licensed Practical Nurses (LPNs) or Licensed Vocational Nurses (LVNs) and 16 were nurses' aides. Two physicians and one respiratory therapist have been convicted for serial murder. An additional seven physicians are awaiting trial (six in murder for profit schemes) and two were acquitted. One medical technician was acquitted of murder, but found liable for $27 million in damages (Table 5).

*Gender/Ethnicity*

Women comprise almost half (49%) of the convicted serial killers in Table 1, however 55% of the total number of prosecuted healthcare providers whose gender was known were female. Males are disproportionately represented among the prosecuted nurses. A national survey of RNs found 6% are male (22), yet 44% of the RNs prosecuted for murder were male. Figure 3 shows the gender breakdown for each professional group. Of the known racial background, the overwhelming majority, 94%, of the prosecuted caregivers are Caucasian. Figure 1 shows the breakdown by country, which provides some insight regarding ethnicity.

*Healthcare Setting*

The distribution of the 90 prosecutions by healthcare setting is shown in Fig. 4. The vast majority of clusters of patient deaths occurred in hospitals. The type of hospital units represented is also summarized in Fig. 4. Some healthcare providers were charged with killing patients in more than one setting, e.g., Genene Jones was associated with a cluster of deaths in a pediatric intensive care unit, and later in a pediatrician's outpatient clinic, and Charles Cullen worked in hospitals and a nursing home. The majority of hospital killings occurred on the night or evening shifts. Several killers were first suspected of killing in a hospital, and after their hospital employment was terminated (often precipitated by the investigation into suspicious deaths) the perpetrator moved to another setting and continued to kill.

*Victims*

Patients who were critically ill, very old, very young, or otherwise vulnerable were most likely to be victims of serial murder. However, quite a few victims were ambulatory with intact cognitive capacity, showing that no patient is immune to a serial healthcare killer. Taking only the most conservative figures from actual convictions for murder, assault, and guilty pleas (Tables 1–3) there were a total of 328 patients whose deaths resulted in a prison or death sentence for the 54 convicted healthcare providers. There were an additional 130 convictions for assault, or attempted murder, of patients who suffered cardiopulmonary arrests and sometimes permanent brain injury, at the hands of these caregivers but were resuscitated. The number of convictions is about 15% of the total number of patient deaths and assaults attributed to these

TABLE 3—*Charged with serial murder, pled guilty to lesser charges.*

| | | | | |
|---|---|---|---|---|
| 1. Neil Hartley | Rochdale, England | Nurse Hosp. Pethidine, Haldol, narcotics | 1998 | Charged w/1 murder. Pled guilty to 6 charges of unauthorized administration of drugs, 1 years suspended License withdrawn |
| 2. Rhea R. Henson | VA, U.S.A. | Nurse, coronary care unit CCU Morphine | 2000 | Charged with 2 murders, pled guilty to distribution of a controlled substance |
| 3. John Walter Bardgett | Bedford, NH, U.S.A. | Nurse, nursing home | 2001–2003 | 2–*x* manslaughter, 4-x attempt. Murder, confessed unauthorized adm. of med., conviction unknown |
| 4. Peggy S. Couse | Marion, IN, U.S.A. | Nurse, nursing home | 2002–2004 | Suspected of involvement 4 suspect. deaths, confessed unauthorized adm. of drugs |
| 5. Coleen M. Thompson | Rockville, MD, U.S.A. | Nurse, ICU | 2003 | Charged with hastening death of 5 patients, 211 suspicious deaths, pled guilty to criminal neglect |

TABLE 4—*Charged with serial murder—trial pending or outcome unknown.*

| Name | Town, Country | Profession Area of Work/ Method | Year | Charged w/Murder, Trail Pending or Outcome Unknown |
|---|---|---|---|---|
| 1. Cheryl May | Fort Wayne, IN, U.S.A. | Nurse, nursing home | 1999 | 1 *x* murder, 5 susp. murders, conviction unknown |
| 2. Name Unknown | Slough, England | Health care assistant, Nrsg home, hosp. | 2000 | Suspected of involvement in the deaths of 4 children |
| 3. Sebastian Fontaine | Boornik, Belgium | Nurse, hosp. | 2001 | Suspected of 6 murders |
| 4. Name Unknown | Nurnberg, Furth, Germany | Aide, elderly home | 2002 | Suspected of 2 attempted murders |
| 5. Name Unknown | Rheinstetten, Germany | Aide, home care | 2002 | Suspected of 10 attempted murders |
| 6. Noreen Mulholland | Leeds, England | Nurse, general fl. Hosp. Insulin | 2002 | Arrested, charged for 2 deaths 18 suspicious deaths |
| 7. Mechthild Bach | Hannover, Langenhagen, Germany | Physician Internal medicine Hosp. Morphine | 2002–2004 | Inquiry into 76 susp. murders, 8 charges of manslaughter |
| 8. Heather Clowe | Dublin, Ireland | Nurse, poison | 2003 | Charged with 2 counts of assault, 2 counts of administering a harmful substance |
| 9. Francine Brunfaut | Brussell, Belgium | Vocational aide, elderly home | 2004 | Suspected of 2-19 murders |
| 10. Female Nurse | Hemel Hempstead, England | Nurse/hosp. Medical equip | 2004 | Arrested on suspicion of 1 murder and attempting to kill 3 other patients |
| 11. Sonia Caleffi | Lecco, Italy | Nurse/hospital Shots w/air-filled needles | 2004 | Arrested on suspicion of 5 deaths |
| 12. Anne Grigg-Booth | Keighley, England | Nurse/hosp. morphine, pethidine & heroin | 2004–2005 | Charged with 3 counts of murder, 1 charge of attempted murder & 13 counts of unauthorized administration of noxious substances Died at home while awaiting trial |
| 13. Doris B. | Straubing, Germany | Nurse/hospital. Morphine | 2005 | Charged w/manslaughter. Arrested, charged on suspicion of killing 7 patients |
| 14. Male Nurse | Leeds, England | Nurse/hospital Insulin | 2002–2005 | Charged with four murders one attempted murder, trial scheduled for 2007 |
| 15. Stephan Letter | Sonthofen, Germany | Nurse Injection drug combination | 2004–2005 | Charged with 16 murders and 12 manslaughter, 1 add'l killing and 2 assaults 70+suspicious deaths |
| 16. Female | Tuttlingen, Germany | Nurse Succinylcholine | 2005 | Charged with 10 deaths |
| *Serial murder for profit* | Town, Country | Area of Work/Method | Year | Charges |
| 17. Male Nurse | Lodz, Poland | ER Hospital various medications | 2004 | Charged with 5 deaths in order to receive payment from funeral parlor. Up to 5000 deaths suspected |
| 18. Male Nurse | Lodz, Poland | ER Hospital various medications | 2004 | Charged with 5 deaths in order to receive payment from funeral parlor. Up to 5000 deaths suspected |
| 19. Male Physician | Lodz, Poland | ER Hospital failure to provide life saving care | 2004 | Charged with 5 deaths in order to receive payment from funeral parlor. Up to 5000 deaths suspected |
| 20. Male Physician | Lodz, Poland | ER Hospital failure to provide life saving care | 2004 | Charged with 5 deaths in order to receive payment from funeral parlor. Up to 5000 deaths suspected |
| 21. Pyor Piyatnichuk | Moscow, Russia | Physician induced coma | 2004 | Charged with aggravated murder of multiple patients in organ transplant market |
| 22. Bairma Shagdurova | Moscow, Russia | Physician induced coma | 2004 | Charged with aggravated murder of multiple patients in organ transplant market |
| 23. Irina Lirstman | Moscow, Russia | Physician induced coma | 2004 | Charged with aggravated murder of multiple patients in organ transplant market |
| 24. Lyudmilla Pravdenko | Moscow, Russia | Physician induced coma | 2004 | Charged with aggravated murder of multiple patients in organ transplant market |

54 caregivers because obtaining evidence of "guilt beyond a reasonable doubt" on all suspicious deaths is not cost-effective. A very alarming statistic is the total number of victims. At least 2113 patients died suspiciously while in the care of a convicted healthcare provider. If we consider the numbers of pending charges against healthcare providers there are an additional 80 murder charges and 26 assault charges, with an additional 242 suspected victims, excluding the up to 5000 deaths that may be associated with murder for payment by a funeral parlor in Poland (Table 4).

### *Methods of Murder and Assault*

Several healthcare providers used more than one method to kill patients. For example, Beverly Allitt injected insulin, potassium chloride, and air, as well as suffocation (23). Figure 5 summarizes the methods used. While the method of killing patients is not specified in 25 cases, at least 51 healthcare providers used injection, 12 used suffocation, followed by drowning, air embolus, oral medications, tampering with equipment, and poisoning. Licensed nurses (RNs, LPNs, and LVNs) in North America typically injected nonnarcotic medications (e.g., epinephrine, insulin, or potassium chloride) into intravenous lines. In Europe, nurses more often used morphine. Among the other medications used were concentrated neuromuscular paralyzing agents such as succinylcholine (Anectine) or Pavulon (Pancuronium) and cardiac medications such as digoxin or Lidocaine.

Nurses' aides tended to use alternate methods, such as suffocation, or use of oral medications or poisons. In Austria, four nurses' aides engaged in a form of so-called oral hygiene that involved pouring water down the patient's throat to drown them (14,16). Some nurses' aides also injected medications; however,

TABLE 5—*Charged with serial murder—acquitted/civil suit damages.*

| Name | Town, Country | Area of Work/Method | Year | Charges, Conviction, Appeal |
|---|---|---|---|---|
| 1. Nurse A. | Toronto, Canada | Nurse, neonatal ICU and peds. unit digoxin injection | 1981 | 18 suspicious deaths of infants, charged with 4 counts of murder, 6 counts of assault. The wrong nurse was arrested. No charges were brought against Nurse A, the nurse associated with the deaths by the CDC study |
| 2. Jane Bolding | Prince George's County, Maryland | Nurse, ICU KCl | 1983–1984 | 17 suspected murders, 23 suspected attempted murders, acquitted after prosecution's case $8 million in damages paid for wrongful death claims |
| 3. Michael Beckelic | Maxwell AFB AL, U.S.A. | Med. tech. Lidocaine | 1988 | 21 suspected murders & 11 attempted murders. $27 million in civil damages for injecting 9 infants |
| 4. Richard Williams | Columbia, MO, U.S.A. | Nurse, V.A. Hosp. Succinylcholine | 1992–2003 | 10 counts of first-degree murder. Liable for $450,000 in wrongful death charges. 41 suspicious deaths. Charges dropped due to new science raising questions regarding toxicology results |
| 5. Thomas K. | Berlin, Germany | Nurse, ICU. Hosp. | 1996 | Charged with 5 counts manslaughter, unaccountable for actions. Admitted to psychiatry |
| 6. Michael Coons | Portland, OR, U.S.A. | Nurse, Nsg. home, Morphine | 1998 | Charged with 4 murders 1 attempted murder. Was not indicted, deemed psychiatrically ill |
| 7. Howard Martin | Conway Wales | Physician G.P. Diamorphine | 2004 | Charged with 3 murders, acquitted of 3, several more being investigated |
| 8. Avola Humphreys | Bodawen, Wales | Nurse/nursing home | 2005 | Charged 1 count manslaughter and 7 assault charges, acquitted |

this was done surreptitiously, as aides are not authorized to administer medications (Fig. 6).

## Motives

Insufficient information was available to systematically analyze the motives behind these murders, however, the literature review, case studies, and confessions of a few of the killers provide some insight regarding motives.

Often, authorities begin investigating serial murder in healthcare settings when they notice a significant increase in the number of cardiopulmonary arrests on a particular unit. If the number of successful resuscitations is higher than expected, this increases suspicion of caregiver-induced arrests. Such a finding raises the possibility that the killer may be seeking secondary gain from the cardiopulmonary arrests and may have had a primary objective of simply causing a code, rather than murder. For example, the prosecutor in the trial of Benjamin Green claims that he injected patients with respiratory paralyzing agents for "the excitement of trying to revive them" (24). Kristen Gilbert, a RN convicted of four murders with 37 suspicious deaths, was having an extramarital affair with a security guard who worked the evening shift at the same hospital. The hospital's protocol required that security be called to all cardiopulmonary arrests. The epidemiological data showed that suspicious codes only occurred when both she and her paramour were on duty (25). Likewise, Richard Angelo, a nurse in New York, admitted he injected patients with Pavulon® (Organon, USA, Roseland, NJ) because of the respect and admiration he got from his colleagues for performing well in a code. During his confession, he likened himself to volunteer firefighters who set fires (14). This motive of secondary gain, or excitement has been labeled a professional version of Munchausen Syndrome by Proxy (MSBP), a psychiatric disorder in which a primary caregiver induces a health crisis in his/her child for the purposes of getting medical attention (1). Professor Roy Meadow, who coined the term, testified at Beverly Allitt's trial regarding MSBP as a possible motive (23). Several nurse serial killers had histories of injecting themselves, or otherwise making themselves ill (Munchausen Syndrome) and Beine's study of European nurses showed several suffered from *psuedologica fantastica* and hypochondria (16). Many of the convicted healthcare providers had falsified their credentials and/or had fabricated critical events (e.g., fire, sexual assault, bomb threat) before being suspected of murdering patients (1).

In contrast to the above, some caregivers simply seemed to get sadistic satisfaction from killing certain types of patients. Colleagues of Orville Lynn Majors testified that they could predict which patients would die while under his care. Patients who were demanding, whiny, or disproportionately added to his workload were at risk. One nurse testified at his trial that she was afraid to

TABLE 6—*Successfully appealed convicted for serial murder.*

| Name | Town, Country | Area of Work/Method | Year | Charges, Conviction, Appeal |
|---|---|---|---|---|
| 1. Filipina Narciso | Ann Arbor, Michigan | Nurse V.A. Hospital med surgical floor, injection, Pavulon | 1975 | Convicted of 1 murder, 3 assaults. 10 suspicious deaths. Appealed, conviction set aside |
| 2. Leonora Perez | Ann Arbor, Michigan | Nurse V.A. Hospital med surgical floor, injection, Pavulon | 1975 | Convicted of 1 murder, 3 assaults. 10 suspicious deaths. Appealed, conviction set aside |
| 3. Jesse McTavish | Scotland | Nurse Geriatric unit, insulin injection | 1974 | Convicted of 1 count of murder, 4 counts of assault, 23 suspicious deaths. Appealed and conviction overturned |
| 4. Robert Allen Weitzel | Layton Utah, TX, U.S.A. | MD/psychiatrist Psychogeriatrics Morphine | 2000–2002 | Convicted of 5 murders, 2 manslaughter, 3 negligent homicides, Sentenced to 15 years. Judge overturned conviction based on procedural error.<br>Charged with prescription drug fraud, convicted and sentenced 1 year for fraud. Recharged for felony manslaughter and negligent homicide |

| US State | # Cases |
|---|---|
| Alabama: | 2 |
| California: | 3 |
| Florida: | 3 |
| Georgia: | 1 |
| Illinois: | 1 |
| Indiana: | 3 |
| Maryland: | 2 |
| Massachusetts: | 1 |
| Michigan: | 4 |
| Missouri: | 1 |
| New Hampshire | 1 |
| New Jersey | 1 |
| New York: | 2 |
| Oklahoma: | 1 |
| Ohio: | 1 |
| Oregon: | 2 |
| Pennsylvania: | 1 |
| Texas: | 5 |
| Virginia: | 1 |
| **Total (19)** | **36** |

| Country | # Cases |
|---|---|
| Austria: | 4 |
| Belgium: | 3 |
| Brazil: | 1 |
| Canada: | 1 |
| England/Wales: | 12 |
| Egypt: | 1 |
| France: | 1 |
| Germany: | 14 |
| Holland: | 3 |
| Hungary: | 1 |
| Ireland: | 1 |
| Italy | 1 |
| Japan: | 1 |
| Norway: | 1 |
| Poland: | 4 |
| Russia: | 4 |
| Scotland: | 1 |
| Switzerland: | 1 |
| United States: | 36 |
| Zimbabwe: | 1 |
| **Total (20)** | **93** |

FIG. 1—*Geographic location.*

go to lunch if she had to temporarily assign her patients to him because she noticed that previously stable patients would collapse while under his care (26). Similar comments from coworkers emerged during the investigation of Barbara Salisbury. However, her defense claimed a different motive; that the pressure of a heavy workload and needing to free up beds in order to admit new patients contributed to her hastening the death of her most ill patients (27). An additional profit motive is suggested in the prosecutions of two nurses and six physicians who apparently worked as teams charged with murder of patients for payment from a funeral parlor, or from an organ transplant market.

## Toxicology

Toxicology evidence can be invaluable in prosecuting healthcare killings. In the conviction of Terri Rachels, postcardiac arrest blood analysis revealed significantly elevated levels of potassium. After one of her patients suffered a cardiac arrest, officials sent the tubing she had used to administer a unit of blood to the lab and

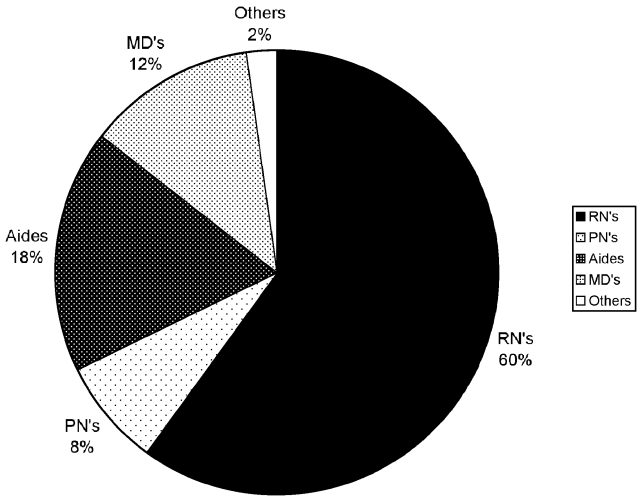


FIG. 2—*Professions.*

found highly concentrated potassium chloride present in the tubing. This evidence was instrumental in obtaining a conviction for assault as the patient was successfully resuscitated. That said, many investigations for murder rely on postmortem, or even post-exhumation toxicological studies, which are analytically challenging, are searching for rapidly degraded drugs, or both. For example, a fatal overdose of intravenous potassium chloride is impossible to detect on analysis of postmortem blood, as after death there is a rapid increase in both serum and vitreous humor potassium (28). However, a contemporary or retrospective analysis of samples collected during a cardiac arrest can reveal unexpected hyperkalemia. The retrieval of syringes with traces of concentrated potassium chloride solution, and DNA consistent with that of the victim's, can be compelling evidence.

The identification of hypoglycemia induced by administering exogenous insulin is also problematic. The triad of low blood glucose, high serum insulin, and low C-peptide is not necessarily specific for insulin overdose (29,30).

The interpretation of postmortem toxicological findings is, at best, difficult (31); however, the finding of a drug in high concentration in the body of a patient for whom it had never been prescribed makes compelling evidence of at least a serious medical error, if not a crime. Such evidence led to murder convictions in several instances.

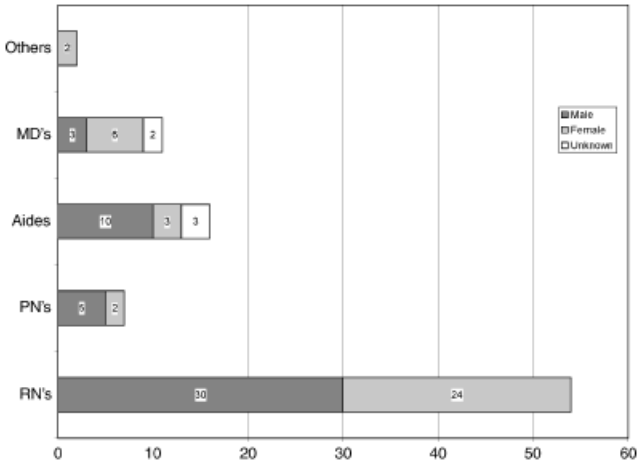


FIG. 3—*Gender.*

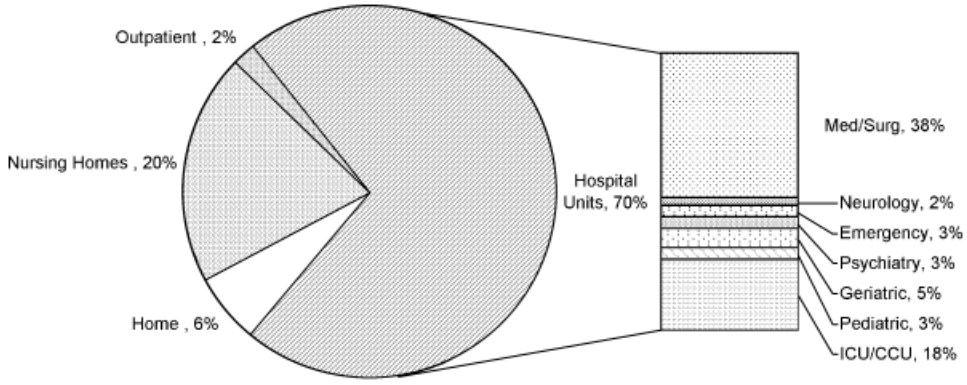


FIG. 4—*Healthcare settings.*

## Legal Outcomes

The burden of proof in a murder trial, as in all criminal trials in Common Law-based jurisdictions, is guilt beyond a reasonable doubt. That is to say, the trier of fact, or prosecutor, has to be sure of the accused's guilt. "*Sure*" means the level of certainty that the prosecutor would apply in every day life when he/she wanted to be absolutely certain of some fact or circumstance. This high standard is not met by simply having a statistical correlation. English courts, for example, have rightly expressed reservations about the judicially perceived misuse of statistical evidence (32). Successful prosecutions have relied on having an array of supporting evidence, including confessions, positive toxicology results, and eyewitness accounts, such as a family member who testified that the nurse injected the patient just before the patient's collapse. Prosecutors searched the home and belongings of several nurses in the investigations described here. Vials of the suspected agent(s), needles, syringes, and hospital records found in nurses' homes were later introduced as evidence.

Statistics alone have proven quite problematic, although when combined with other evidence they can be quite useful. During the trail of a nurse in Maryland, an epidemiologist testified for the prosecution that one nurse was 57 times more likely to have patients die in her care than all other evening shift nurses (19). The judge ruled this finding insufficient to prove guilt of murder. However, the same evidence may be used in a civil suit for wrongful death or malpractice, as occurred in the Maryland case which resulted in $8 million in civil damages, because in those proceedings there is need to only show a preponderance of the evidence—i.e., the trier of fact only has to be sure by slightly over 50% that the evidence favors the plaintiff's case. Similarly, the case involving Michael Beckelic had insufficient evidence to show guilt beyond a reasonable doubt, but civil suits against him resulted in $27 million in awards to the families of nine infants he was charged with injecting.

## Intervention and Prevention

While the information available in this study did not allow for a thorough assessment of the opportunities for intervention and prevention, several observations seem relevant based on the data collected. The frequency with which hospitals were the site of healthcare murder prosecutions most likely reflects several things, including easy access to injectable medications, availability of patients with intravenous lines, reduced oversight during evening and night shifts, the frequent use of float nursing personnel, and less than routine quality assurance activities that may increase the

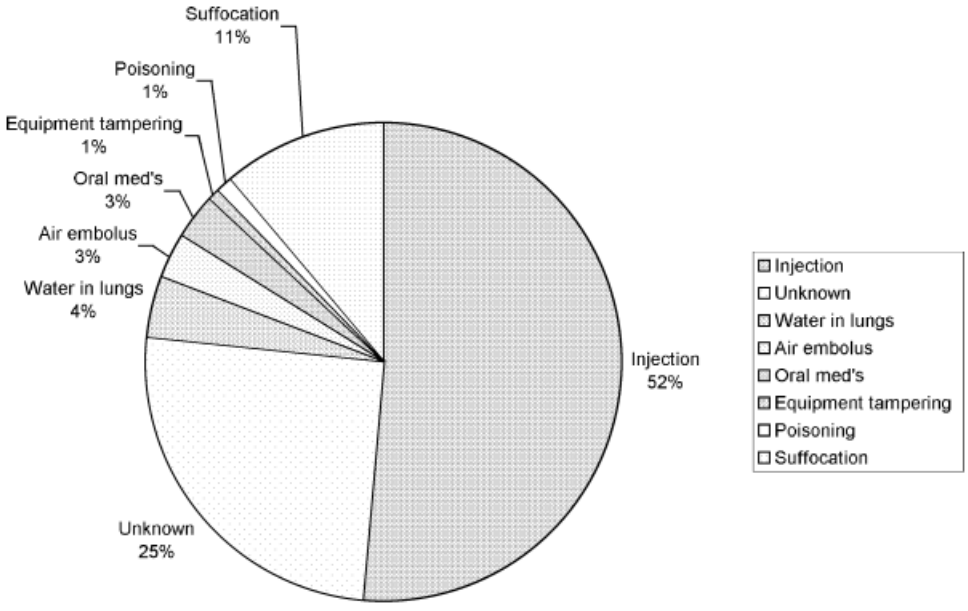


FIG. 5—*Methods.*

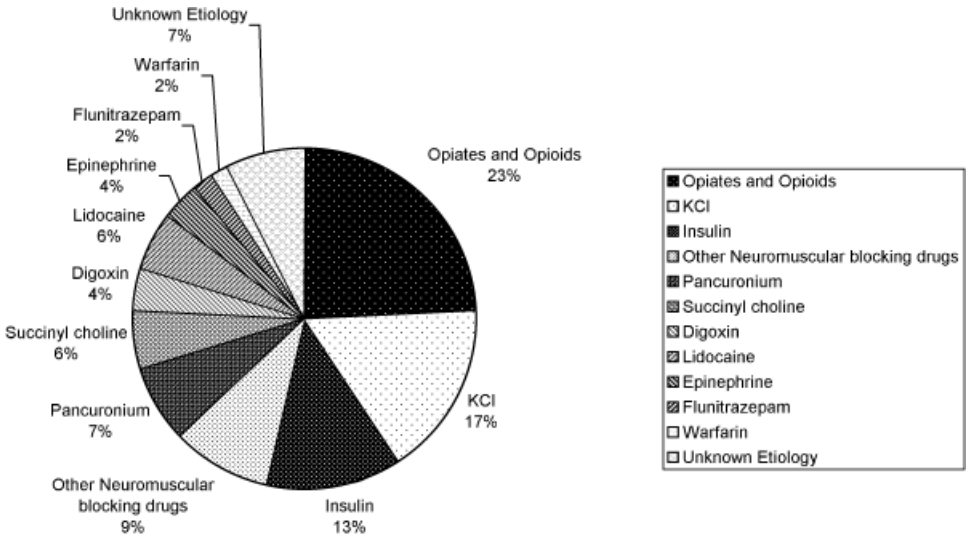


FIG. 6—*Drugs used.*

likelihood of these crimes going undetected. Current practices that allow licensed practitioners easy access to noncontrolled, potentially lethal injection medications with typically little accountability for use of such medications is one area that should be carefully considered for ways to prevent the occurrence of healthcare-related serial murder.

Of particular interest was the observation that while very few of the killers had a criminal record, many of them had histories of falsifying their credentials or other aspects of their background. Such falsifications were often not picked up during the hiring process, and in cases when they were known about, did not seem to present a significant barrier to hiring. The propensity to engage in fraud or fabrication of significant information is consistent with sociopathic traits and with Munchausen Syndrome (1). Healthcare employers should consider any fraud or misrepresentation a serious risk factor.

Clearly, hospital hiring practices vary, and today, they may be significantly influenced by the widespread shortage of nurses. At present, risk management approaches seem to favor policies geared toward preventing lawsuits for wrongful termination, denial of employment, or defamation. While such suits can be successfully defended against if truthful information regarding job performance is given, the cost of defending an employment rights lawsuit is often several hundred thousand dollars. Unfortunately, this cost appears to have influenced current risk management policies. Less well appreciated seems to be the fact that the cost of hiring a serial killer, even if not criminally convicted, can result in multimillion dollar civil suit verdicts for negligent hiring and wrongful deaths. A better balance is needed between the employment rights of caregivers and the ability of healthcare facilities to know about the backgrounds of employees. We encourage healthcare employers to be forthcoming with references that include information that a healthcare worker was fired, or to provide information regarding adverse patient outcomes associated with the presence of a particular caregiver.

Case study data showed that in some instances hospital administrators and physicians were uncooperative with prosecutors in their investigations—usually simply by stonewalling the investigators, but in two cases actually obstructing the investigation. The reasons cited for being uncooperative included fear of negative publicity, fear of civil suits for negligence, fear of civil suits by nurses being investigated, and poor record keeping. For example, in the case of Orville Lynn Majors, the hospital's death review committee, which was supposed to meet monthly, had met one time during the year that was the focus of the investigation (26).

In contrast, in the Georgia prosecution, hospital administrators worked so effectively with law enforcement that the epidemic lasted only 3 months—the shortest of the suspicious epidemics documented in this series. A surveillance protocol set up in collaboration with the Georgia Bureau of Investigation deterred further suspicious cardiac arrests and allowed solid evidence to be collected that led to a conviction. The investigation occurred discretely without concerns of a "witch hunt" or civil rights violations that have often plagued these prosecutions. Healthcare employers should provide an atmosphere that facilitates staff reporting of concerns about patient safety or criminal behavior. Such an approach is consistent with efforts to promote the nonpunitive environment that is needed to promote patient safety and healthcare error reporting.

This review of prosecutions of serial murder by healthcare providers underscores the need to raise awareness of this phenomenon; to routinely gather epidemiologic, toxicologic, and psychological data about such occurrences; and to ensure policies and procedures that achieve a balance between protecting employee rights and ensuring patient safety. Current practices that allow licensed practitioners easy access to noncontrolled, otherwise therapeutic medications should be examined, and procedural safeguard designed to track injectable dosing. The violation of trust and training that occurs when the skills designed to provide safety are used to harm patients makes serial murder by healthcare providers a particularly heinous crime.

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