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Advances in diagnostic codes to document sexual assault in health care service

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Abstract

Objective: To explore trends in documented sexual abuse/assault (SA) related episodes in California hospitals and emergency departments (ED), including the impact of a change in health care service reporting codification (from ICD-9-CM to ICD-10-CM) that more clearly defined SA in October 2015.

Data Sources: Hospital and ED data were drawn from California's Office of Statewide Health Planning and Development (OSHPD).

Study Design: Descriptive and trend analyses of SA-related hospital and ED records (including patients' demographic information) were conducted to determine whether changes in ICD codification had an impact on documented SA-related episodes.

Data Collection: All SA-related episodes (ICD-9-CM codes 995.83, 995.53; ICD-10-CM codes T74.21-T74.22, T76.21-T76.22) in California hospitals and EDs for the last decade of available data (2008–2017) were analyzed ($n = 20,215$).

Principal Findings: An abrupt increase in documented SA episodes in hospitals and EDs began in October 2015, when specific ICD10 codes for suspected cases of SA were created. Documented SA-related episodes doubled in 1 month (164 vs. 385 episodes in September 2015 and October 2015, respectively). More than half (58.2%) of all SA-related episodes documented in Oct 2015 were coded as suspicious. The number of documented SA-related episodes continued increasing to the end of the time series (December 2017). Overall, the annual number of documented SA-related episodes increased by over 700% in only 4 years (900 vs. 6441 in 2013 and 2017, respectively), suggesting high rates of prior under-reporting and the need to introduce the new codes. African Americans were disproportionally impacted; however, the highest increases in age-adjusted rates between the ICD-9-CM and the ICD-10 codification period were found among the White population (2.46 vs. 16.53 per 100,000 inhabitants).

Conclusions: SA episodes in the clinical population have been underestimated for many decades. Identifying SA victims and measuring SA-related health care utilization is a real challenge that needs further investigation.

KEYWORDS
domestic violence, hospitalizations, sexual abuse, sexual assault

What is known on this topic
- Sexual abuse/assault (SA) is a national public health problem with significantly high health care costs.
- Health care settings offer a critical opportunity for detection and prevention of SA, yet, very few studies on the utilization of health services involving SA in emergency departments and hospitals have been published.

What this study adds
- Improvements in diagnostic codes (when specific codes for suspected cases of SA were created) dramatically increased documented SA-related episodes in health care services.
- This finding lends support to the idea that SA-related health care utilization has been underestimated for many decades and points to the value of more expansive diagnostic codification of SA.

1 | INTRODUCTION

In the United States, 1 in 5 women will be raped in their lifetime, and nearly 1 in 2 women and 1 in 5 men will experience sexual abuse/assault (SA) victimization other than rape.[1] Common consequences of SA include long-term mental health problems (e.g., anxiety, depression, eating disorders), substance abuse, labor and academic difficulties, unwanted pregnancy and/or pregnancy at a young age, and adverse physical health outcomes.[1-3]

Health care settings offer a critical opportunity for detection, prevention, and intervention of SA. The unique relationship of medical personnel with patients plays an important role in the detection of SA. Strategies to identify SA victims include SA screening during regular health exams, close clinical follow-up for victims and potential victims of SA, incorporating violence into routine history and inquiry, as well as creating a confidential, safe and supportive environment. Medical staff are in an ideal position to work from a preventive framework and address risk behaviors.[4] Educational messages in health care settings, including displaying posters and brochures on SA, can also contribute to creating an appropriate environment and openness to discuss SA concerns. Although patients may be unwilling to report SA during the first few visits, such interactions can make the hospital or ED be perceived over time as safe and supportive. Medical staff can use patient relationships not only to identify SA victims but also to provide patients with information on local and national resources and refer them for subspecialty evaluation and treatment.[4]

Under California Penal Code section 11160, all California medical providers are mandated reporters when treating an injury caused by "abusive or assaultive" behavior, even against patients' wishes to file a police report.[5] Therefore, medical staff may be required to file a police report if a patient discloses that the injury for which they are treated was caused by abuse or assault. However, SA mandatory reporting against patients' wishes raises important professional and ethical considerations for patients and medical staff and may have major detrimental consequences, including retaliatory abuse. In addition, it could prevent victims from seeking appropriate medical care and may compromise doctor-patient relationships and patients' trust and confidentiality, and may create a barrier to open and honest discussion.[6] Health care settings proffer a system for surveilling population rates of violence in real time and evaluating the impact of potential community-level prevention strategies. Some states have established surveillance systems for monitoring abuse-related hospitalizations and emergency department (ED) visits; however, very few studies on trends and risk factors for reported episodes involving SA in hospitalizations and ED visits have been published.[4,7]

As has been known for decades, the tools for accurate coding of violence in clinical populations are underdeveloped or not used frequently.[7,8] The US Department of Justice estimated that nearly 4 in 10 women who sought ED care for violence-related injuries in the late 1990s were victims of some form of abuse, but only 7 in 100,000 hospitalized patients had an abuse code in their medical records.[8] Significant progress has been made in recent decades, but still little is known about the extent and accuracy of documenting violence-related episodes in clinical populations, and very few scientific projects attempt to assess the use of codes and tools to document violence in health care services.[7]

The International Classification of Diseases (ICD) is a globally used diagnostic tool for epidemiology, health management, and clinical purposes that assigns codes to document morbidity and mortality-related diagnoses and medical procedures, including circumstances

and external causes of diseases or injuries.[9] The ICD is maintained by the World Health Organization (WHO) and was originally designed to promote the systematic recording, analysis, and comparison of health data from different countries or regions.[10] ICD codes are found in a wide range of medical documentation, including hospital records, medical charts, visit summaries, and medical bills. The WHO provides periodic updates and reviews of the ICD. The 10th version, in use since 2015, is called ICD-10 and includes approximately 70,000 disease codes. The International Classification of Diseases, Clinical Modification (ICD-CM) is an adaption created by the US National Center for Health Statistics (NCHS) under the Health Insurance Portability and Accountability Act (HIPAA) to document medical diagnoses and procedures and track health care billing in the United States.[11] In the United States, the ICD Coordination and Maintenance Committee (C&M), comprised of representatives from the Centers for Medicare and Medicaid Services (CMS), National Center for Health Statistics (NCHS), and the Centers for Disease Control and Prevention (CDC), is responsible for periodic updates and reviews of the ICD-CM.[11] The Committee provides a forum to discuss proposed changes to ICD-CM for both public and private stakeholders. Proposals for new codes include a description of the code being requested and a justification for why it is needed, including scientific references and literature supporting the request.[11]

There are numerous ICD codes to document the circumstances and external causes of illness and injury, including child and adult abuse. Notably, the scope of abuse-related codification has broadened due to recent changes in physical, emotional, sexual, and neglected abuse-related codes. The International Classification of Diseases, tenth revision (ICD-10) captures SA episodes, both confirmed and suspected (codes T74.21, T74.22 and T76.21, T76.22, respectively). This contrasts with the previous ICD-9 codes, which identified SA-related episodes (codes 995.83, 995.53), but did not include the option to classify episodes as suspected or confirmed[7,8,12,13]; therefore, suspected episodes were not identified and not recorded as SA-related hospitalizations or ED visits. The new ICD-10 codes arose as a result of the WHO's efforts to improve the documentation of violence. The ICD-CM is based on the ICD, and both the ICD and ICD-CM include the codes and changes described above.

The present study describes the documented number of SA-related episodes in California hospitals and EDs for the last 10 years of available data (2008–2017), a time period that includes the transition from ICD-9-CM to ICD-10-CM codes (October 1, 2015). The study specifically explores the impact of a change in reporting codification on documented SA. In addition, it highlights turning points in a time series to inform health care workers and public health authorities how changes in codification affected the number of documented episodes involving SA in a clinical population.

2 | METHODS

Hospital and ED visit rates in California were examined. Data on service utilization were drawn from California's Office of Statewide

Health Planning and Development (OSHPD) hospital dataset, a government-sponsored health care register that includes records from all licensed hospitals and EDs in California. The OSHPD data provided anonymized information from hospitals and EDs on patient characteristics (residential ZIP code, sex, age, race/ethnicity), principal diagnosis (the condition established to be the chief cause of the admission or ED encounter), and up to 24 coexisting diagnoses (comorbidities), procedures, expenses, and source of payment, as well as health facility information. The ICD-CM is used to code medical diagnoses and procedures.

The study sample comprised all records (20,215) for which SA-related codes (ICD-9-CM codes 995.83, 995.53; ICD-10-CM codes T74.21, T74.22, T76.21, T76.22) were established as chief cause or contributing condition for the hospitalizations or the ED encounters for years 2008–2017. The International Classification of Diseases, 9th version, Clinical Modification (ICD-9-CM) was used to code records between January 2008 and September 2015, while the ICD-10-CM was used to code records between October 2015 and December 2017. A patient with documented SA may have multiple hospitalizations and ED visits; therefore, the unit of analysis is SA-documented hospitalization and ED episodes rather than patients. Importantly, these codes include episodes of sexual abuse against children and sexual assaults against adults, and each of these episodes could include a single event or events that are within a greater pattern of repeated sexual violence; moreover, SA can include a range of components, including coercion. E-Codes and Y07 codes can be used to identify who committed the act of violence. ICD-9-CM V-Codes can be used to identify patients with a history of abuse and violence; specifically, code ICD-9-CM V71.5 (and the equivalent ICD-10-CM Z04.4) can be used to code "Observation following alleged rape or seduction." Neither E and V codes (external causes of injury and supplemental classification) nor Y codes were available in the dataset. However, the total number of hospitalizations and ED visits for each ICD-CM code, including "Observation following alleged rape or seduction" ICD codes (ICD-9-CM V71.5 and ICD-10-CM Z04.4) are publicly available (https://oshpd.ca.gov/data-and-reports/healthcare-utilization/). Changes in some specific codes to identify SA episodes could potentially affect the use of other available related codes. Although ICD-9-CM V71.5 and ICD-10-CM Z04.4 codes were not available in our dataset, and we cannot analyze these data at an individual level, we provide the total number of hospitalizations and ED visits for which ICD-9-CM V71.5 and ICD-10-CM Z04.4 codes were used (Figure 1A). In addition, Figure 1 includes the number of health care episodes in which other types of abuse (ICD-9-CM codes 995.8, 995.5; ICD-10-CM codes T74, T76) were documented in order to provide further context for our study (Figure 1B).

Characteristics of SA-related hospital and ED admissions were described (Table 1), including victims' age and gender, race/ethnicity, admissions per month, SA alone versus SA in combination with physical and psychological abuse and neglect (ICD-9-CM codes 995.8, 995.5; ICD-10 codes T74.2, T76.2), number of hospitalizations versus ED visits, patients insurance status (a potentially good proxy for income), hospital length of stay (LOS), hospital average charge per
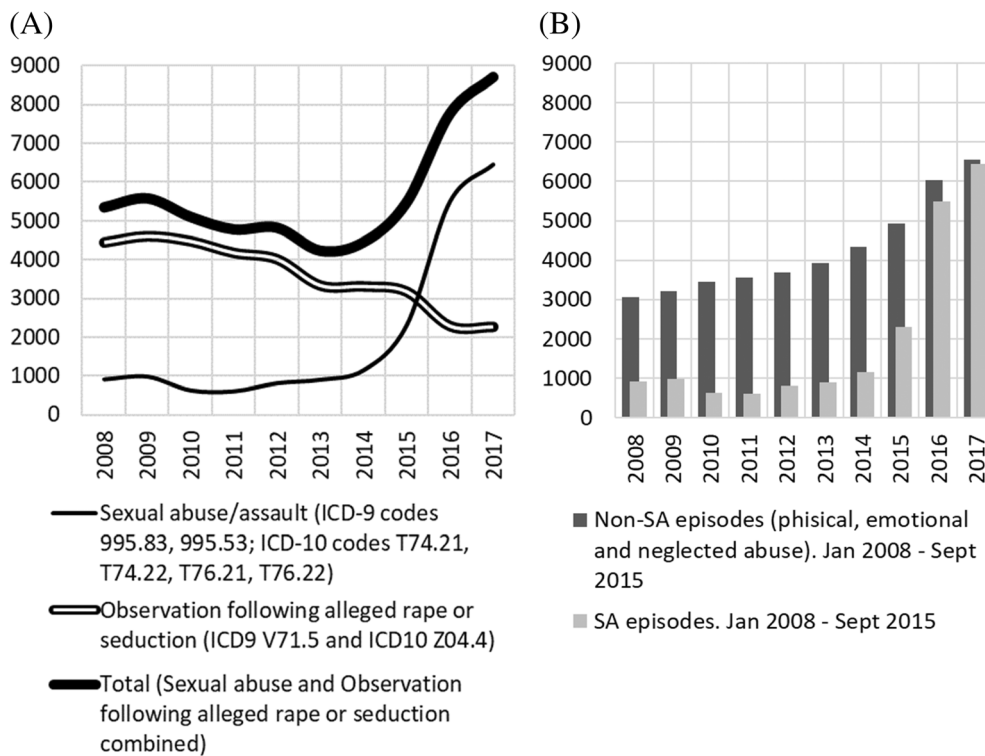
(A)

Sexual abuse/assault (ICD-9 codes 995.83, 995.53; ICD-10 codes T74.21, T74.22, T76.21, T76.22)

Observation following alleged rape or seduction (ICD9 V71.5 and ICD10 Z04.4)

Total (Sexual abuse and Observation following alleged rape or seduction combined)

(B)

■ Non-SA episodes (phisical, emotional and neglected abuse). Jan 2008 - Sept 2015

■ SA episodes. Jan 2008 - Sept 2015

FIGURE 1 Number of documented "observation following alleged rape or seduction" and abuse-related episodes in hospitals and emergency departments (EDs). California, 2008–2017. (A) Annual number of episodes involving SA* and observations following alleged rape or seduction**. (B) Annual number of documented sexual, physical, emotional, and neglected abuse episodes. *Sexual abuse/assault (ICD-9 codes 995.83, 995.53; ICD-10 codes T74.21, T74.22, T76.21, T76.22). **Observation following alleged rape or seduction (ICD-9-CM V71.5 and ICD10 Z04.4). *Source*: https://oshpd.ca.gov/data-and-reports/healthcare-utilization/

admission and hospital total charge. Data on LOS and charge was not available for ED visits. The OSHPD dataset does not include data on patient income or education. Therefore, we provide three residence-related socioeconomic indicators (percentage of families living under the poverty line, unemployment rates, and percentage of adults with formal education less than high school graduation in the patient residence area) based on the patients' residence zip code. The 2010 US Census Bureau was used to calculate these three socioeconomic indicators (Table 1). Then, descriptive statistics of the analyzed sample were divided into two different time periods, the ICD-9-CM (January 2008–September 2015) and the ICD-10 codification period (October 2015–December 2017) (Tables 2 and 3). We compared descriptive statistics on the above variables for the period before and after the improvements in diagnostic codes (October 2015) when specific codes for suspected cases of SA were created (Table 2); in addition, we compared descriptive statistics for suspected and confirmed SA episodes in California during the ICD-10 code period (October 2015–December 2017) (Table 3). This was done to identify possible changes in characteristics of health care episodes documenting SA as a result of the transition from ICD-9-CM to ICD-10-CM codes on documented SA-related episodes, including potential changes in victims' gender and age (including in minors vs. adults), in-hospital mortality ratio, patients' health insurance status, and LOS and hospital charge, as well as patients' residence socioeconomic characteristics. For comparability, all hospital charge data were inflation-adjusted using the medical care consumer price index (Bureau of Labor Statistics, 2021) to 2017 dollars, representing the dollar value at the end of the study period.[14] Demographic rates were estimated for five racial/ethnic groups (White, Hispanic/Latinx, Black/African American,

Indigenous/Native American, Asian / Pacific Islander) within the time periods above and the complete time series (Figure 1B). For comparability, age-adjusted rates were estimated (Figure 2). Age-adjusted rates are usually estimated when comparing populations with different age structures (e.g., White and Hispanic populations) to eliminate differences in crude rates that result from differences in the populations' age distributions. Age-adjusted rates are the demographic rates we would have obtained if the study population had the same age distribution as the standard population. The "2010 US standard population" was used for calculating age-adjusted rates.[15] Microsoft Excel 2016 and R statistical software ("trend," "lsmeans," "ts," and "zoo" R packages) were used to generate the graphs and conduct all analyses.

3 | RESULTS

Over the 10-year study period, we found a precipitous increase in documented sexual abuse/assault (SA) episodes in hospitals and EDs due to a dramatic rise of ICD-10-CM T74 and T76 codes in medical records. In contrast, ICD-9-CM V71.5 and ICD-10-CM Z04.4 codes ("observation following alleged rape or seduction") also used to document sexual violence gradually reduced over time (Figure 1A). This suggests that the sudden increase in SA codes may be related to a change in the documentation of SA episodes. Documented SA went from representing one-fifth to half of all abuse-related episodes in 4 years (20.8% and 48.8% in 2014 and 2017, respectively) (Figure 1B).

All hospitalizations and visits to EDs documenting SA (ICD-9 codes 995.83, 995.53; ICD-10 codes T74.21, T74.22, T76.21, T76.22) in California between January 2008 and December 2017 (20,215

TABLE 1 Descriptive statistics on sexual assault/abuse-related episodes (hospitalizations and emergency department visits) variables

Admissions per month (average)	217
Abuse type	
SA	19,716 (97.5%)
SA in combination with other types of abuse	499 (2.5%)
Number of deaths and mortality ratio	8 (0.04%)
Emergency visits versus hospitalization	18,650 (92.3%)
Patient insurance status	
Other federal and nonfederal programs	2516 (12.4%)
Medicare	833 (4.1%)
Medicaid (Medi-Cal)	9026 (44.7%)
Workers' compensation	26 (0.1%)
Private insurance	4520 (22.4%)
Self-pay	2909 (14.4%)
Invalid/blank'; other payers	385 (1.9%)
Hospital* cost and length of stay (LOS)	
LOS	6.4
Average charge per admission	$48,281
Total charge	$81,465,034
Gender (female)	17,785 (88.0%)
Age (average)	24
Minor (age < 18)	7256 (35.9%)
Race/ethnicity	
White	7327 (36.2%)
Black	3533 (17.5%)
Hispanic	6643 (32.9%)
Asian/Pacific Islander	622 (3.1%)
American Indian/Alaska Native	107 (0.5%)
Unknown/Invalid/Blank/other	1983 (9.8%)
Patients' residence socioeconomic indicators	
Families living under poverty line	13.1% (SD 8.2)
Unemployment	10.1% (SD 3.4)
Education less than high school graduate	21.1% (SD 14.1)
Total	20,215

Note: California 2008–2017.

episodes) were analyzed. Of these, 92.3% were ED visits, and 7.7% were hospitalizations. Table 1 reports descriptive statistics on SA-related episode variables. An average of 217 SA-related episodes per month were documented in hospitals and EDs between January 2008 and December 2017. We found relatively few hospital and ED episodes reporting SA (499 out of 20,215, 2.5%) in combination with other abuse types. Eighty-eight percent of SA victims were females and 35.9% were minors. Eight out of 20,215 patients died at the health care facility during the SA episode; six of these eight patients were classified as Hispanic (not shown in Table 1). The average hospital LOS was 6.4 days, and the average charge per hospitalization was $48,281, accounting for $81,465,034 in hospitalizations alone for the

entire time series. Information on expenses for ED visits was not available. Medicaid was the most common patient's insurance status (44.7%). Relatively few patients had Medicare (4.1%), and one-third of patients (36.8%) had private insurance or paid out of pocket the cost of the health care service. Three basic patients' residence socioeconomic indicators were analyzed. SA victims resided in areas with a level of poverty, unemployment, and low formal education similar to or even below the state average. Overall, SA victims did not reside in particularly socioeconomically disadvantaged areas (Table 1).

Figure 2A displays the number of documented SA episodes per month, including confirmed and suspected cases during the ICD-10 period (October 2015 to December 2017). Documented SA episodes abruptly increased (step-shaped increment) beginning October 2015 (164 vs. 385 episodes in September 2015 and October 2015, respectively) when ICD-10-CM specific codes for suspected/confirmed cases were created. Six out of 10 of all SA-related episodes documented in Oct 2015 (224 out of 385, 58.2%) were coded as suspected. Importantly, the increasing trend in documented SA-related episodes began in October 2015 (385 documented SA episodes), continued in 2016 (457.3 documented SA episodes per month) and 2017 (536.8 documented SA episodes per month), and yet, the percentage of SA episodes coded, as suspected, did not increase over time (58.2%, 56.8%, and 56.7% in October 2015, 2016, and 2017, respectively).

Age-adjusted rates for health care episodes in which SA was documented were estimated for two time periods, the ICD-9-CM (January 2008 – September 2015) and the ICD-10 codification periods (October 2015–December 2017). The age-adjusted rate increased from 2.51 to 14.27 per 100,000 between the ICD-9-CM and the ICD-10 codification period. Figure 2B shows age-adjusted rates estimated for five race/ethnic categories and all race/ethnic categories combined for these two time periods. African Americans were disproportionally impacted by SA in both time periods compared to any other race/ethnic group (e.g., 8.60 vs. 2.51 annual episodes per 100,000 inhabitants in African Americans and the general population, respectively, between January 2008 and September 2015); however, the greatest increase in the age-adjusted rate between the ICD-9-CM and the ICD-10 codification period was for White persons the age-adjusted rate increased by 6.7 (2.46 vs. 16.53). The rate increased by 6.0 and 5.9 for Hispanic and Native Americans, respectively, and by 5.6 and 4.4 for Asians and for African Americans, respectively.

Table 2 reports descriptive statistics on documented SA-related episodes for the ICD-9-CM (January 2008–September 2015) and the ICD-10-CM code period (October 2015–December 2017). The number of documented SA episodes per month dramatically increased after ICD codes for suspected SA were created in October 2015 (77.1 vs. 483 episodes per month during the ICD-9-CM and ICD-10-CM code period, respectively; *p* < 0.001). The percentage of documented SA episodes in combination with other types of abuse slightly decreased during the ICD-10-CM period (3.7% vs. 1.8%, *p* < 0.001). There was a minor increase in the percentage of emergency visits versus hospitalization (+3.7%; *p* < 0.001). Therefore, we found a slightly higher increasing trend in documented SA in ED as compared to hospitals. A few relevant changes in the insurance status of patients with

TABLE 2 Descriptive statistics on California Hospital and emergency departments episodes documenting SA for two time periods, ICD-9-CM (January 2008–September 2015) and ICD-10-CM code period (October 2015–December 2017)

	January 2008–September 2015	October 2015–December 2017	Diff.
Admissions per month (average)	77.1	483	405.9; $p < 0.001$*
Abuse type			
Sexual assault/Abuse (SA)	6907 (96.3%)	12,809 (98.2%)	
SA in combination with other types of abuse	267 (3.7%)	232 (1.8%)	−1.9; $p < 0.001$*
Number of deaths and mortality ratio	3 (0.04%)	5 (0.03%)	−0.01; $p = 0.905$
Emergency visits versus hospitalization	6448 (89.9%)	12,202 (93.6%)	3.7; $p < 0.001$*
Patient insurance status			
Medicare	299 (4.2%)	534 (4.1%)	−0.1; $p = 0.803$
Medicaid (Medi-Cal)	2362 (32.9%)	6664 (51.1%)	18.2; $p < 0.001$*
Other federal and nonfederal programs	1347 (18.8%)	1169 (9%)	−9.8; $p < 0.001$*
Workers' compensation	3 (0%)	23 (0.2%)	0.16; $p = 0.011$*
Private insurance	1612 (22.5%)	2908 (22.3%)	−0.2; $p = 0.780$
Self-pay	1285 (17.9%)	1624 (12.5%)	−5.4; $p < 0.001$*
Invalid/blank'; other payers	266 (3.7%)	119 (0.9%)	−2.8; $p < 0.001$*
Hospital* cost and length of stay (LOS)			
LOS	5.9 (SD 13)	6.9 (SD 11)	1; $p = 0.007$
Average charge per admission	41,596	58,788	17,192; $p < 0.001$*
Total charge	30,198,692	49,322,822	19,124,130; $p < 0.001$*
Gender (female)	6366 (88.7%)	11,419 (87.6%)	−1.1; $p = 0.016$*
Age (average)	22.6 (SD 15)	24.9 (SD 15)	2.3; $p < 0.001$*
Minor (age < 18)	3000 (41.8%)	4256 (32.6%)	−9.2; $p < 0.001$*
Race/ethnicity			
White	2291 (31.9%)	5036 (38.6%)	6.7; $p < 0.001$*
Black	1438 (20.0%)	2095 (16.1%)	−3.9; $p < 0.001$*
Hispanic	2281 (31.8%)	4362 (33.4%)	1.6; $p = 0.017$*
Asian/Pacific Islander	201 (2.8%)	421 (3.2%)	0.4; $p = 0.093$
American Indian/Alaska Native	33 (0.5%)	74 (0.6%)	0.1; $p = 0.314$
Unknown/Invalid/Blank/other	930 (13.0%)	1053 (8.1%)	−4.9; $p < 0.001$*
Patients' residence socioeconomic indicators			
Families living under poverty line	13.57% (SD 8.4)	12.76% (SD 8.07)	−0.81; $p < 0.001$*
Unemployment	10.20% (SD 3.4)	10.02% (SD 3.48)	−0.18; $p < 0.001$*
Education less than high school graduate	21.87% (SD 14.6)	20.62% (SD 13.79)	−1.25; $p < 0.001$*
Total	7174	13,041	

Note: *The values represent as statistically significant $p < 0.05$ values.

documented SA were noted. The percent of patients with Medicaid (Medi-Cal) increased significantly (32.9% vs. 51.1%; $p < 0.001$), while federal and nonfederal programs (18.8% vs. 9%; $p < 0.001$) and self-pay (17.9% vs. 12.5%, $p < 0.001$) decreased. The percent of adults (6.7%, $p < 0.001$) and White patients (9.2%; $p < 0.001$) slightly increased during the ICD-10-CM period, while the percentage of African American patients decreased (−3.9% $p < 0.001$). A slight decrease in patient residence-based adverse socioeconomic indicators was found (e.g., the percentage of families living below the poverty line in the patients' areas of residence was 13.57% vs. 12. 76% for the ICD-9-CM and ICD-10-CM code period, respectively), suggesting that the

increase in documented SA-related episodes was not disproportionately impacting the most disadvantaged areas in terms of poverty, unemployment, and education (Table 2).

Table 3 reports descriptive statistics on suspected and confirmed SA during the ICD-10 code period (October 2015–December 2018). A higher number of suspected than confirmed episodes per month (277.4 vs. 205.6, respectively, $p < 0.001$) was found. There was a minor decrease in the percent of female (86.3% vs. 89.3%; $p < 0.001$) and adult (86.3% vs. 89.3%; $p < 0.001$) patients with suspected cases of SA compared to confirmed cases. The percentage of ED visits versus hospitalizations was slightly

TABLE 3 Statistics on variables for suspected and confirmed sexual assault/abuse-related episodes in California during the ICD-10 code period (October 2015–December 2017)

	Confirmed	Suspected	Diff.
Admissions per month (average)	205.6	277.4	71.8; p < 0.001*
Abuse type			
Sexual assault/abuse (SA)	5435 (97.9%)	7374 (98.5%)	0.6; p = 0.021*
SA in combination with other types of abuse	116 (2.1%)	116 (1.5%)	
Number of deaths and mortality ratio	2 (0%)	3 (0%)	0%; p = 0.908
Emergency visits versus hospitalization	5149 (92.8%)	7053 (94.2%)	1.4%; p < 0.001*
Patient insurance status			
Medicare	228 (4.1%)	306 (4.1%)	0; p = 0.950
Medicaid (Medi-Cal)	2756 (49.6%)	3908 (52.2%)	2.6; p = 0.004*
Other federal and nonfederal programs	459 (8.3%)	710 (9.5%)	1.2; p = 0.017*
Workers' compensation	16 (0.3%)	7 (0.1%)	−0.2; p = 0.009*
Private insurance	1292 (23.3%)	1616 (21.6%)	−1.7; p = 0.021*
Self-pay	724 (13%)	900 (12%)	−1; p = 0.079
Invalid/blank'; other payers	76 (1.4%)	43 (0.6%)	−0.8; p < 0.001*
Hospital* cost and length of stay (LOS)			
LOS	7.7	6.1	−1.6; p = 0.029*
Hospital total charge (average charge per admission in parenthesis)	26,034,907 (63,087)	25,834,903 (58,134)	−4953; p = 0.509
Gender (female)	4956 (89.3%)	6463 (86.3%)	−3%; p < 0.001*
Age (average)	27.08 (SD = 13.7)	23	−3.7; p < 0.001*
Minor (age < 18)	4198 (75.63%)	4587 (61.24%)	−14.4%; p < 0.001*
Race/ethnicity			
White	2206 (39.7%)	2830 (37.8%)	−1.9; p = 0.023*
Black	882 (15.9%)	1213 (16.2%)	0.3; p = 0.638
Hispanic	1783 (32.1%)	2579 (34.4%)	2.3; p = 0.006*
Asian/Pacific Islander	218 (3.9%)	203 (2.7%)	−1.2; p < 0.001*
American Indian/Alaska Native	31 (0.6%)	43 (0.6%)	0; p = 0.906
Unknown/invalid/blank/other	431 (7.7%)	622 (8.3%)	0.6; p = 0.263
Patients' residence socioeconomic indicators			
Families living under poverty line	12.49 (SD = 8.1)	12.96 (SD = 8.1)	0.47; p < 0.001*
Unemployment	9.91 (SD = 3.4)	10.09 (SD = 3.5)	0.18; p = 0.018*
Education less than high school graduate	20.13 (SD = 13.6)	20.97 (SD = 13.9)	0.84; p < 0.001*
Total	5551	7490	

Note: *The values represent as statistically significant p < 0.05 values.

higher in patients with suspected cases of SA compared to confirmed cases (94.2% vs. 92.8%; p < 0.001). A slightly higher percent of patients with Medicaid (Medi-Cal) (52.2% vs. 49.6%; p < 0.001) and other federal and nonfederal programs (9.5% vs. 8.3%; p < 0.001) was found in patients with suspected cases of SA compared to confirmed SA cases, while private insurance was more frequent among confirmed cases (23.3% vs. 21.6%; p = 0.021). Relatively similar ethnic/racial distribution was found in suspected cases of SA compared to confirmed cases. Patients' residence socioeconomic indicators were also relatively similar in both groups (Table 3).

4 | DISCUSSION

Health care data offer a unique resource to identify and study SA.[7] Here, we describe documented SA-related episodes in California hospitals and ED from 2008 to 2017. Using the largest representative data set in California (OSHPD), our study sample comprised 20,215 documented SA episodes as related to ICD codification.

The transition from ICD-9 to ICD-10 codes on October 1, 2015 (allowing both suspected/confirmed cases to be reported) abruptly increased the number of documented SA episodes in California hospitals and EDs (164 vs. 385 episodes in September 2015 and
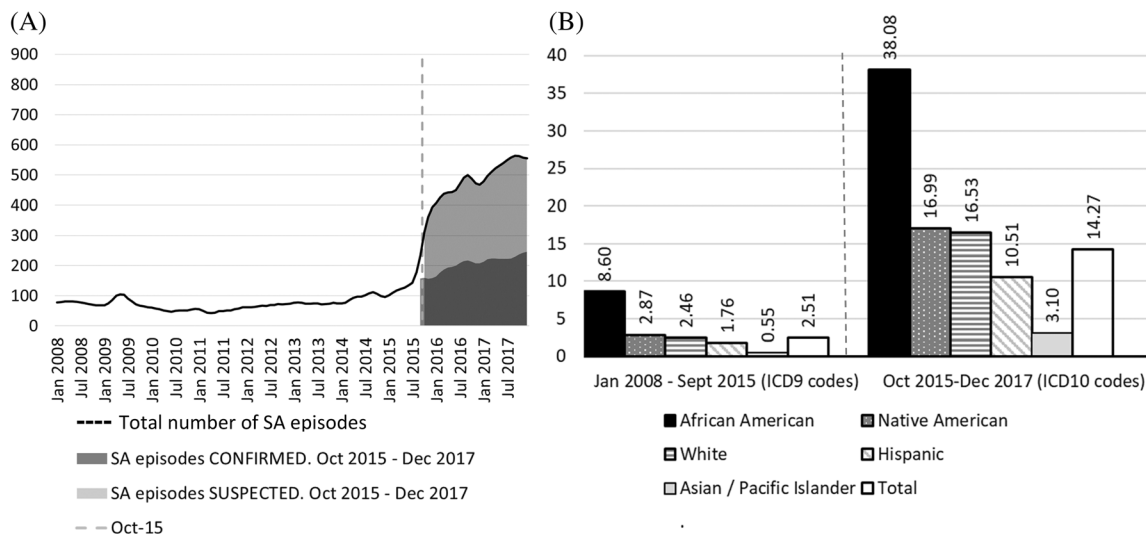
FIGURE 2 California sexual assault/abuse (SA) -related episodes estimated in two time periods, ICD-9-CM (January 2008–September 2015) and the ICD-10 codification period (October 2015–December 2017). (A) Monthly number of documented SA during the ICD-9-CM and the ICD-10 codification period. (B) Age-adjusted rates of SA-related episodes estimated for five race/ethnic categories during the ICD-9-CM and the ICD-10 codification period.

October 2015, respectively). These findings suggest that reported SA-related hospitalizations and ED visits in California dramatically increased due to the ability to document cases based on more inclusive ICD codes. Moreover, the current findings suggest that SA-related health care utilization has been underestimated for many decades.

SA went from representing 20.8% of all reported adult and child abuse-related episodes in 2014 to 48.8% in 2017, just 4 years later. It is important to note that the use of codes to report suspected cases of adult and child abuse beginning in October 2015 applied to all types of abuse-related episodes (including neglect, physical, emotional, and SA), and yet, only abuse-related episodes involving sexual components significantly increased with the transition from ICD-9 to ICD-10 codes in October 2015, when codes for suspected episodes were created (Figure 1B). These findings lend support to the idea that identifying SA victims in health care facilities is particularly difficult, and measuring SA-related health care utilization is a real challenge. Very little is known about the usefulness of the screening tools to identify victims of SA, including their sensitivity and specificity.[7,16] From October 2015 to December 2017, most documented SA-related episodes were coded as suspected. The new codes were massively used by health care personnel beginning from October 2015, which seems to reflect the need for a broader range of codes to document sexual violence in the clinical population. Based on these results, we can assume that an unknown number of SA cases could not even be identified as suspected cases. Our evaluation of descriptive statistics on SA for the period before and after October 2015 (Table 2) does not lend additional insight into why there was an increase in documented SA. Further investigation is urgently needed to address these important issues and make improvements in the codification of medical records.

Consistent with the literature,[7,12] high age-adjusted rates of hospital and ED episodes involving SA were found in the African American population. African Americans are victims of violent crimes, including SA, at a higher rate than other racial groups.[17] Risk factors for the victimization of sexual violence, including being young, single, impoverished, and an urban inhabitant, disproportionately affect the African American population.[18,19] In addition, the racism, sexism, and economic oppression experienced by African Americans in their communities and when dealing with criminal justice, education, and health care, make this racial group highly vulnerable to sexual violence.[18–20]

4.1 | Limitations

The strength of this study comes from using information from a large representative dataset. A descriptive study design, as well as several difficulties in estimating the true number of SA victims in health care services, are the main limitations of this study.

A core limitation of the study is that we cannot explain trends in documented SA-related episodes within the ICD-9-CM and the ICD-10-CM time period. It is possible that the coding continued to increase gradually during the ICD-10-CM time period due to greater awareness of the new codes available for suspicious SA-related episodes. The design of our study does not allow us to explain why not only suspected but also confirmed episodes did not stop growing in 2016 and 2017. Under the Affordable Care Act (ACA), Medi-Cal coverage expanded in 2014.[21] Potential contributing factors for the increase of documented SA-related episodes include improvements in SA screening processes in recent years and the 2014 ACA expansion.[21] Changes in patients' health insurance status found in Tables 2 and 3 are consistent with the 2014 ACA expansion. The

implementation of effective SA screening processes in health care settings has been demanded by advocates and stakeholders for a long time.[22,23] The need for early identification, prevention, and intervention for victims of sexual violence was highlighted with the publication of the Institute of Medicine 2011 report and the subsequent adoption of these recommendations by the US Department of Health and Human Services (DHHS) to implement the women's preventive services provision in the ACA,[23] including violence screening. Our study design precluded establishing causal relationships to explain current trends and confirm or reject the above hypotheses in SA-related health care documentation.

In addition, a significant portion of SA-related health care services could be missed. Here are a few of the reasons why hospitalizations and ED visits could be missed: (1) Many health settings do not screen for SA adequately.[7,24] Challenges to an effective implementation of screening of violence and intervention in health care settings include inadequately trained staff and a lack of specific protocols to enable health care professionals to screen and make referrals as needed.[23] (2) Moreover, the true volume of SA-related health care utilization could be much higher because not all coexisting conditions are reported in our dataset; as a standard rule, only those that contribute to explaining the health care service must be reported. Therefore, we assume that the full number of victims of SA in health care services is likely underestimated. On the other hand, the unit of our analysis is SA-related hospitalization, and ED episodes and some episodes could correspond to patient readmission. (3) Additionally, OSHPD data only includes hospital admissions/discharges. SA diagnoses occurring in nonhospital settings (e.g., community clinics and private offices of therapists, psychologists, and physicians) were not analyzed; only SA cases in which the victim seeks medical care in hospitals or EDs were analyzed. (4) Finally, as discussed in the introduction, other ICD codes than those used here can be used to improve the identification of SA episodes and the accuracy of the data analysis. For example, the codes we used in our analysis to identify SA are also often used to identify domestic violence and thus, do not sufficiently allow us to distinguish between types of violence perpetrators.[7,8,12,13] These differences can be critical in estimating the true number of victims of SA in health care services, as well as the identification and implementation of prevention strategies for a community.

Further investigation is needed to better understand trends and estimate the true number of SA victims in health care services.

In conclusion, a remarkable prevalence of SA was found in California's clinical population in most recent years, yet, very few studies of health services involving SA in emergency departments and hospitals have been published. The results of the study indicate that SA-related clinical populations have been underestimated for decades. A dramatic increase in documented SA involving health care utilization was found associated with the change in ICD codification of SA. This finding points to the need for more accurate and expansive violence-related ICD codes in health care settings. Documentation and coding of violence can improve health services and health surveillance, conduct useful research, and adequately design health policies to prevent and control violence. Improved documentation and coding will ultimately benefit care for victims of violence and ensure that standardized treatment for a medical problem is provided and medical expenses are reimbursed.[8,25,26]

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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