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## Accidental firearm fatalities Forensic and preventive implications

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**Abstract** Out of a total of 624 consecutive gunshot autopsies from Münster and Hamburg, Germany, 32 cases (5.1%) were accidental. The accidents were self-inflicted in 3 cases while another person fired the gun in the remaining 29 cases. More than half of the victims were younger than 25 years and 75% were male. A single gunshot injury was present in all cases and the head was struck in 47% but a detailed analysis of the entrance wound sites did not show any preferential anatomical sites. A surprising finding was the presence of five contact or near contact gunshots (16%). The reasons for these and most other accidents were extreme carelessness when handling a firearm, the involvement of children or adolescents or a foolish behaviour with a gun intended to impress others. Gun-cleaning accidents occurred rarely and there were no major technical defects of the weapons. Preventive measures should concentrate on strict inaccessibility of guns to children and on increased educational efforts to subgroups at risk such as hunters and members of the armed forces. A single non-contact gunshot injury from a long-barrelled firearm can be considered typical for an accident but the great variety and the possible presence of “disguised” suicides and homicides requires a careful forensic investigation including inspection of the scene and reconstruction of the events. It is recommended that a case should always be considered to be non-accidental in the beginning of an investigation.

**Keywords** Firearms · Fatalities · Accident

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### Introduction

Accidental firearm fatalities represent a multi-faceted subgroup. The differentiation between suicide or homicide can be challenging because the basic difference between accidents on the one hand and suicides or homicides on the other, is the intention of the person shooting which can be difficult to determine in retrospect. Furthermore, both suicides and homicides may be disguised as accidents by the suicide, family members or the perpetrator and the definition of what exactly constitutes an accident may also vary (e.g. “russian roulette”). All this explains why the relative frequency of accidental firearm fatalities reported in the literature varies greatly between 1.3% and 9.2% [2, 3, 7, 10, 12, 13, 22, 24, 25, 28, 29, 32]. There are few publications based on larger series [10, 25, 26, 30] and case reports mostly concentrating on hunting accidents [e.g. 4, 5, 15, 16, 17, 31, 33] or exceptional settings [e.g. 19]. In this study, 32 accidental firearm fatalities from two regions in Germany were analysed to find common characteristics which may assist in the forensic investigation and prevention of these cases.

### Material and methods

A total of 624 gunshot fatalities were examined where autopsies had been carried out at the Institute of Legal Medicine, University of Münster, Germany, from 1967 to 1997 ( $n=302$ ) and at the Institute of Legal Medicine, University of Hamburg, Germany, from 1985 to 1997 ( $n=322$ ). The manner of death could not be determined reliably in 15 cases and analysis of the 577 suicides and homicides has been published before [21]. The remaining 32 accidents were re-examined on the basis of the detailed autopsy report including photos and examination of the clothing, the police report, and the report of the firearms examiner.

### Results

The 32 accidents constituted 5.1% of the total of 624 gunshot autopsies. Another person fired the gun in 29 of the accidents (91%) and the fatal injury was self-inflicted in

**Table 1** The age distribution of the victims in the 32 accidents

Age (years)	No. of cases
4–14	7 (22%)
15–24	10 (31%)
25–39	6 (19%)
40–59	8 (25%)
60–79	1 (3%)

**Table 2** The types of firearm used in the 32 cases. The three “other” weapons included one nail gun, one gas pistol and one pen gun

Firearm	Pistol	Revolver	Shotgun	Rifle	Other	Unknown
No.	10	1	6	10	3	2

**Table 3** The general distribution of the entrance wound sites in the 32 gunshot injuries

Body region of injury	n
Head	15 (47%)
Back, lateral trunk	6 (19%)
Chest	6 (19%)
Abdomen	3 (9%)
Neck	2 (6%)

only 3 cases (9%). The male to female ratio was 3:1, the mean age was 28.9 years (range 5–76 years) and more than half of the victims were younger than 25 years old (Table 1). Long-barrelled guns (50%) outnumbered short-barrelled guns (34%) among the firearms used (Table 2).

All victims suffered a single gunshot injury only. The head was struck in almost half of the cases (Table 3) but the distribution of the entrance wounds did not show preferential anatomical sites (Tables 3, 4). Distant gunshots clearly predominated when another person fired the gun but a total of five contact or near contact gunshots (16%) also occurred (Table 5) as briefly described:

1. A 56-year-old experienced gunsmith had been working on the breech of a repeating rifle with an 8 mm×68S cartridge inside the chamber. He forgot to remove it when he subsequently soldered the sight onto the barrel. The heat ignited the cartridge and the casing was accelerated backwards exiting from the open breech. The casing caused a near-contact abdominal wound including perforation of the aorta. Published as a case report by Kellermann et al. [23].
2. An 11-year-old boy was allowed to play with “unloaded” guns together with two friends. One was putting a 6.35 mm pistol onto the left chest of the victim when a gunshot went off traversing the chest from left to right, resulting in a contact wound and exsanguination.
3. A 20-year-old man smoked cannabis together with a friend, who fumbled with a revolver wrapped inside a plastic bag. When he (jokingly, so he said) aimed at the victim, a gunshot discharged causing a near-contact gunshot and an entrance wound in the forehead.

**Table 4** The distribution of the 15 entrance wounds in the head

Site of wound	n
Eye	3
Right temple	2
Left temple	2
Forehead	2
Cheek	2
Back of head	2
Ear	1
Submental	1

**Table 5** The shooting distance in the 32 gunshots

Shooting distance	Non-self-inflicted	Self-inflicted
Contact	1	0
Near contact	2	2
Intermediate	5	1
Distant	21	0

**Table 6** The types of activity leading to the fatal accidents

Type of activity	n
Children shot by another child when “playing” with guns	6
Hunting accidents	6
Bragging, showing off	5
Armed forces	4
Skirmish, struggle	4
Discharge when (mis)handling the firearm while being alone	2
Gun-cleaning accidents	2
Accident at work	2
“Shooting contest”	1

4. A 42-year-old man was involved in a “shooting contest” on distant targets together with his neighbour. Both persons were on their respective balconies situated one above the other. The neighbour handed the 5.6 mm rimfire rifle to the victim from below when a gunshot went off resulting in a near contact gunshot and an entrance wound in the right temple.
5. A 17-year-old teenager carelessly handled a 9 mm blank cartridge pistol while no other person was present resulting in a near contact shot and a large tissue laceration of the neck and chin.

A variety of activities have led to the fatal gunshots (Table 6): the six cases where children shot another child while “playing” with guns were very similar to case history 2. The major factors responsible for the six hunting accidents, which have been included in previous studies [18, 20], were improper handling of the firearm and mistaking the victim for game. The three adolescents bragging with their guns jokingly pretended to shoot a friend (see case history 3) while the two adults carelessly handled the firearms while showing off in front of other persons. In the armed forces, three fatalities were due to careless carrying or handing over of a firearm and one case occurred on the shooting range from a long distance. The

four cases where a skirmish preceded the gunshot included one police officer shot by another officer while arresting a suspect. A technical defect responsible for the accident was not found and minor defects possibly contributing to the accident such as worn-out parts reducing the trigger pull weight were present in a few firearms.

## Discussion

The predominance of young males was also found in large demographic series of firearm accidents from the USA, Denmark, Sweden and Jordan [1, 10, 13, 25, 26, 30]. In particular, the percentage of children aged 4–14 years (22%) clearly exceeds that of suicides (1%) and homicides (2%) from the same series [21]. Of the seven accidents in this age group, six occurred when children played with guns (Table 6) and this scenario was also common in studies from the USA [8, 14, 34]. Children obviously take guns for toys and may not really comprehend the painful reality behind the idea of death. This calls for strict parental/custodian precautions concerning access of children to guns, whether unloaded or not. Prevention of these tragic cases relies on the understanding that firearms are not toys and do not belong in the hands of children.

Contrary to the cases of suicide and homicide [21], long-barrelled guns outnumbered pistols and revolvers in this as well as in other accidental series [1, 13, 25, 26] except for one [10]. Some types of long-barrelled firearms may be more susceptible to careless handling and/or used more frequently in accident-prone situations such as hunting. The relative frequency of hunting accidents – 19% in this study and 7–60% in others [10, 25, 27] – depends on geographical and cultural factors. Hunting accidents from both Münster [20] and Hamburg [18] have been analysed before.

A single gunshot injury was exclusively present in this study. This is a regular finding in accidents but a few exceptional cases of multiple entrance wounds due to cross-fire or an automatic weapon have been mentioned briefly [1, 12, 25]. In this as well as in other series [1, 10, 14, 25, 26], the head and chest were the most common entrance wound sites while extremity wounds were absent or occurred infrequently, which reflects the limitation to fatal accidents. In unselected hunting accidents including survivors, extremity wounds almost equalled those to the head, neck and trunk together [20].

The shooting distance has been considered in one study where non-distant injuries occurred in less than 10% of two-party accidents [25] but in this series the percentage of non-distant injuries was higher. In particular, the presence of five contact or near contact gunshots was surprising because contact between the muzzle and the body is something no reasonable person should tolerate. The case histories show that extreme carelessness, involvement of children and adolescents or exceptional settings such as soldering can explain this extraordinary finding.

Typical features therefore are single non-contact gunshot injuries from long-barrelled firearms but the great va-

riety of accidents and the possible presence of “disguised” suicides or homicides requires a careful investigation including inspection of the clothing and scene and reconstruction of the events. Meticulous attention should be paid to the individual characteristics of a case. The sceptical approach of Copeland [10] and DiMaio [11], who always start an investigation with the working hypothesis that the case is not accidental, appears fully justified.

The five major subgroups (children, hunting, showing off, armed forces, skirmish) together account for almost 80% of the cases while typical gun-cleaning accidents occurred rarely and relevant technical defects were not found. This demonstrates, in accordance with other publications [6, 9, 11, 20, 26, 31], that human errors not technical defects are responsible for the vast majority of firearm accidents. The typical human error was extreme carelessness while handling, carrying or storing a loaded firearm. Preventive measures should therefore concentrate on strict inaccessibility of guns to children and on increased educational efforts concerning the potential dangers when handling a firearm. Education should be directed in particular towards young adults and subgroups dealing regularly with firearms such as hunters or members of the armed forces.

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