HAL
open science

# On choking and ingestion hazards for children in the United States

Frédéric Chabolle, Paul Deheuvels

## To cite this version:

Frédéric Chabolle, Paul Deheuvels. On choking and ingestion hazards for children in the United States. [Research Report] LPMA - Laboratoire de Probabilités et Modèles Aléatoires. 2019. hal-02194486

**HAL Id: hal-02194486**

**https://hal.science/hal-02194486v1**

Submitted on 29 Sep 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# On choking and ingestion hazards for children in the United States

Frédéric Chabolle, Paul Deheuvels[a,b,1,*]

*Service d'ORL et de Chirurgie Cervico-Faciale, Hôpital Foch, 40 rue Worth, 92150 Suresnes, France & L.P.S.M., Sorbonne Université, Paris, France*

[a] *7 avenue du Château, 92340 Bourg-la-Reine, France*
[b] *L.P.S.M., T15-25 - 2ème étage, Sorbonne Université, 4 Place de Jussieu, 75252 Paris Cedex 05, France*

**Abstract**

The risks of Unintentional Suffocation injuries in the U.S. must be reconsidered in view of the existent mortality and morbidity statistics. In particular, fatal injuries due to the Sudden Unexpected Infant Death Syndrome [SUIDS] should be treated on their own and separated from this group. Because of a non-appropriate nomenclature, the risks of injuries due to Aspiration and/or Ingestion of Foreign Bodies have been overestimated in the recent decades, and should be reconsidered by a factual scrutiny of the statistical data.

*Keywords:* `elsarticle.cls`, LaTeX, Elsevier, template

*2010 MSC:* 00-01, 99-00

## 1. Introduction

In the U.S., *Suffocation* has been, for long, reputed to be the leading cause of mortality and morbidity of *Unintentional Injuries* in children. For example in [1], *Unintentional Suffocation* is ranked as the number 1 leading cause of accidental deaths in the U.S., in 2013, for children of age < 1 (979 deaths), as the number 3 (in a scale of decreasing gravity) for children of ages 1-4 (161

*Corresponding author
*Email address:* `pr.fchabolle@gmail.com, paul.deheuvels@upmc.fr` (Frédéric Chabolle, Paul Deheuvels)
[1] Emeritus Professor

deaths), as the number 4 for children of ages 5-9 (44 deaths), and as the number 5 for children of ages 10-14 (37 deaths) (see, also, [2] for counts in 2000-2006). The data displayed in [1] and [2] has been updated for 2017 in [3]. In this last reference, in the U.S. and for 2017, *Unintentional Suffocation* is ranked as the number 1 leading cause for children of age <1 (1106 deaths), as the number 3 for children of ages 1-4 (110 deaths), as the number 4 for children of ages 5-9 (36 death), and as the number 6 for children of ages 10-14 (35 deaths). The data in [1, 2, 3] illustrate the stability of numbers and rankings of fatal *Unintentional Suffocation* injuries in the U.S. through the last decade (see, also, [4]).

Among all possible causes of *Unintentional Suffocation Injuries* in children, *Foreign Body Aspiration* [FBA] is reputed to be a significant public health issue with presumably high mortality rate. We refer to [5, 6, 7] for reviews and introduction to the general study of *Foreign Body Injuries*. The study of FBA has given rise to considerable interest in the literature (see, e.g., [8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34]). The annual overall inpatient cost associated with pediatric bronchial FBA is evaluated by [25] to about $12.8 million. The overall mortality of FBA injuries (with respect to all fatal and non-fatal injuries)is evaluated by [13] to 0.29%, by [19] to 0.8% and by [35] to 0.6%. These differences follow from different analysis of the treatments of the FBA injuries. *Foreign Body Ingestion* [FBI] is another class of *Foreign Body Injuries*. In general, Foreign Bodies can entry in the human body through various ways (aspiration, ingestion or insertion). According to [34], in the U.S., in 2010, there were about 535,000 emergency department visits with foreign body-related primary diagnosis . With some exceptions, such as FBI caused by batteries, pointed objects and magnets (see, e.g., [36, 37]), FBI generate mostly non-fatal accidents (see, e.g., [38, 39, 40, 41, 36, 42, 43, 44, 45, 35, 46, 47]), and the discussion in the sequel. Some types of FBI may result in *suffocation*, but such is generally not the case. We will nevertheless consider jointly FBA and FBI, to treat in the same framework all possible injuries related to *Foreign Bodies*. Our interest will be centered on the age-class 0 to 19, and

more specifically, to young children aged 0 to 9 who present a specific accidental behavior. A general review of FBI injuries for adults is to be found in [37]. The nature of FBA and FBI injuries depends largely upon the type of foreign body involved (see, e.g., [48]). It may be food (see, e.g., [8, 38, 49, 50]), non-food (see, e.g., [32, 51]), or miscellaneous solid or flexible objects including balloons, coins, seeds, nuts, safety pins, pen caps, balls, marbles, toy components or small batteries (see, e.g., [52, 53, 5, 54]). The concern about safety hazards related to choking and suffocation accidents has given rise to a number of safety alarms and epidemiological studies (see, e.g., [1, 2, 3, 55, 11, 56, 20, 57, 58, 59, 60, 21]). Some of these investigations show clearly that the accidental risks are mostly similar between different countries, and the corresponding comparisons will not be investigated in the present paper, which will be essentially centered on the U.S. situation (see, also, [61, 62, 63, 23, 64]).

A close investigation of the number of casualties due to *Foreign Body Aspiration or Ingestion* will show that they are largely outnumbered by other causes of *Unintentional Suffocation*. In the present paper, we shall investigate the existent statistical data concerning these injuries, with emphasis on the situation of the U.S. Our findings leads us to reconsider the classification of the corresponding risks. We will show, namely, that the injuries usually grouped under the class of *Unintentional Suffocation* (in the ICD-10 codes, see below) form a heterogeneous class, covering to a large extent the numerous victims of the *Sudden Unexpected Infant Death Syndrome* [SUIDS] which have not much to do with the injuries induced by *Foreign Bodies*. By sorting out the SUIDS from the general class of *Unintentional Suffocation* injuries, we are lead to completely reconsider the rating of these risks within the class of *Unintentional Injuries*.

In the first place, the meaning of *Unintentional Suffocation* must be made precise. It refers to the series of codes from W75 up to W84 in the 10th revision of the International Statistical Classification of Diseases [ICD-10], available at [65]. The ICD coding of diseases and related health problems has been owned and copyrighted by the World Health Organization [WHO] since 1983. The

WHO collects the mortality statistics corresponding to the various codes of ICD-10, which are freely available, either on the WHO Mortality Database (see, e.g., [66]), or in the official databases of the different countries (for the U.S., see, e.g., [67]). In either of these sites, the mortality counts are available by year, age and by ICD-10 codes. With respect to the U.S., some restrictions are imposed to the access of the counts in [67], referring to the Public Health Service Act (42 U.S.C. 242m(d)). In the present paper, we followed line by line the terms of these data use restrictions, noting that, when available, the mortality counts in [67] coincide exactly with those of [66], for which no data use restriction is enforced. When such is the case, the data may be cited without any restriction. Within the U.S., the ICD-10 classification has given rise to a national variant called the ICD-10 Clinical Modification [ICD-10-CM], which we will discuss later-on (see, e.g., [68]).

In the ICD-10 nomenclature, *Unintentional Suffocation* injuries (and in particular, *Foreign Body Aspiration* injuries) are grouped within Chapter XX (*External Causes of Morbidity and Mortality*, under the section *Other External Causes of Accidental Injury* (codes W00-X59), and subsection *Other Accidental Threats to Breathing* (codes W75-W84). We also mention the subsection *Exposure to Inanimate Mechanical Forces* (codes W20-W49) of Chapter XX, which will be appropriate for *Foreign Body Ingestion*. The description of these codes is as follows (refer to [65, 69]).

- W75.ab Accidental suffocation and strangulation in bed [ASSB]
- W76.ab Other accidental hanging and strangulation
- W77.ab Threat to breathing due to cave-in, falling earth and other substances
- W78.ab Inhalation of gastric contents
- W79.ab Inhalation and ingestion of food causing obstruction of respiratory tract

- W80.ab Inhalation and ingestion of other objects causing obstruction of respiratory tract
- W81.ab Confined or trapped in a low-oxygen environment
- W83.ab Other specified threats to breathing
- W84.ab Unspecified threat to breathing

The ICD-10 codes covering *Foreign Body Ingestion* injuries are as follows:

- W44.ab Foreign body entering (the body) into or through eye or natural orifice
- W45.ab Foreign body or object entering through skin

Finally, we mention the injuries classified with Chapter XVIII *Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified*, and more specifically under the section *Ill defined and unknown causes of mortality* (codes R95-R99). These are as follows.

- R95 Sudden infant death syndrome [SIDS]
- R96 Other sudden death, cause unknown
- R98 Unattended death
- R99 Other ill-defined and unspecified causes of mortality

The values of the additional (optional) sub-codes a and b refer to the place where the injury has been inflicted and to the activity of the victim. The value of a is 0, when the injury was inflicted at home, 1 in a residential institution, 2 at school or in another institution and public administrative area, 3 in a sports and athletic area, 4 on a street or highway, 5 in a trade and service area, 6, in an industrial and construction area, 7 in a farm, 8 in an other specified place, and 9 in an unspecified place. The value of b is 0 when the victim was engaged in sports activity, 1 in leisure activity, 2 while working for income, 3 while engaged in other types of work, 4 while resting, sleeping, eating or engaging

in other vital activities, 8 while engaged in other specified activities, 9 during an unspecified activity. As follows from these rules, the philosophy of ICD-10 coding is oriented towards *analyzing the behavior of the victims at the time where the injuries have been inflicted*. This should allow to identify a dangerous behavior in view of future prevention of the corresponding risks. In the present paper, these sub-codes will not play any role, even though they need to be mentioned.

On the opposite of ICD-10 codes, the ICD-10 CM codes are oriented towards the *control of the clinical treatment of injuries, and their billable or non billable status with respect to health insurance*. Because of this, they follow different classification rules that the standard ICD-10 codes. In particular, they do not refer to the location or activity of the injury victim, as is the case with ICD-10, but rather, to the clinical description of the injury itself. In particular, they seek the explicit cause of injury when the latter is available. The ICD-10 CM codes, follow a different nomenclature and numbering than the ICD-10 codes, are as follows. First, the ICD CM code T71 is used to code *Asphyxia*, namely of a severely deficient supply of oxygen that arises from abnormal breathing. It is noteworthy that *Asphyxia* comprises *Choking*. *Asphyxia* may result in coma and death, but it is not always the case, and only a limited number of the corresponding accidents are deadly. The corresponding ICD-10-CM codes are as follows.

- T71 Asphyxiation
- T71.1XXL Asphyxiation due to mechanical threat to breathing
- T71.11wL Asphyxiation due to smothering under pillow
- T71.12wL Asphyxiation due to plastic bag
- T71.13wL Asphyxiation due to being trapped in bed linens
- T71.14wL Asphyxiation due to smothering under another person's body (in bed)

- T71.15wL Asphyxiation due to smothering in furniture
- T71.16wL Asphyxiation due to hanging
- T71.19wL Asphyxiation due to mechanical threat to breathing due to other causes

The additional sub-code w takes value 1 when the cause of injury is accidental, 2 when it is intentional self-harm, 3 when it comes from an assault, 4 when the cause is undetermined. Finally X stands for blank. Second, the ICD-10-CM Code T17 groups injuries caused by *foreign bodies in respiratory tract*. These are as follows.

- T17 Foreign body in respiratory tract
- T17.0XXL Foreign body in nasal sinus
- T17.1XXL Foreign body in nostril
- T17.2xyL Foreign body in pharynx
- T17.3xyL Foreign body in larynx
- T17.4xyL Foreign body in trachea
- T17.5xyL Foreign body in bronchus
- T17.8xyL Foreign body in other parts of respiratory tract
- T17.9xyL Foreign body in respiratory tract, part unspecified

The sub-code x equals 0 when the foreign body is unspecified, 1 when it is gastric contents, 2 when it is food, and 9 for other foreign bodies. X stands for blank. The value of y is 0 when the foreign body causes asphyxiation, and 8 when it causes an other injury. Second, the ICD-CM Code T18 captures the Foreign bodies in alimentary tract. The sub-code L is a letter, taking values A for initial encounter, D for subsequent encounter, and S for sequela. We have the following family of codes.

- T18 Foreign body in alimentary tract
- T18.0XXL Foreign body in mouth
- T18.1xzL Foreign body in esophagus
- T18.2XXL Foreign body in stomach
- T18.3XXL Foreign body in small intestine
- T18.4XXL Foreign body in colon
- T18.5XXL Foreign body in anus and rectum
- T18.8XXL Foreign body in other parts of alimentary tract
- T18.9xyL Foreign body of alimentary tract, part unspecified

The above sub-code x equals 0 when the foreign body is unspecified, 1 when it is gastric contents, 2 when it is food, and 9 for other foreign bodies. The sub-code X stands for blank. The value of the sub-code z is 0 when the foreign body causes compression of trachea, and 8 when it causes an other injury. The sub-code L takes value A for initial encounter, D for subsequent encounter, and S for sequela.

We must also mention the codes of the *Sudden Infant Death Syndrome* [SIDS] (these are part of the general class of *Sudden Unexpected Infant Death Syndrome* [SUIDS]) which has recently been included in the latest version of the ICD-10 CM coding, effective since October 1, 2018 (see, e.g., [68]). They are is classified under the following nomenclature.

- Z84.82 Sudden Infant Death Syndrome [SIDS]

The necessity of giving the list of codes for either ICD-10 our ICD-10 CM is of some importance to illustrate the fact that both nomenclatures are essentially different, with no obvious inclusions of the ICD-10 CM codes into ICD-10 codes, and vice versa. The situation is even more complex with the ICD-10 Procedure Coding System [ICD-10-PCS] (see, e.g., [70]) which is a procedure classification

published by the U.S for classifying procedures performed in hospital impatient healthcare settings. The conjuction of ICD-10, ICD-10 CM and ICD-10 PCS, renders epidemiological studies delicate, to say the least. Because of this, we shall limit ourselves to the discussion of the readily on-line available official mortality statistics based upon ICD-10 codes only.

The official mortality statistics delivered in [67] by the American Centers for Disease Control and Prevention [CDC], as well as that given in [66] by the World Health Organization [WHO] make a clear distinction between ICD-10 codes W75 (ASSB) and R95 (SIDS) (see above). However, it is very well possible for a medical examiner to class a cause of death into either W75 or R95 for no obvious reason. This problem is mentioned by several authors who point out on-going variations in the the classification of victims into these different ICD-10 codes (see, e.g., [71]). Along this line, [72] mentions that, in the U.S., death certifiers (medical examiners and coroners) represent a diverse group with notable reporting differences. [73] discusses the observed differentiation of victims of SUIDS in the U.S., and their repartition into the ICD-10 codes R95: sudden infant death syndrome [SIDS], R99: other ill-defined and unsuspected cause of mortality, and W75: accidental suffocation and strangulation in bed [ASSB]. They report for the two-year period 2003-2004, in the U.S., an estimated total of 7547 victims of SUIDS, out of which 2128 were listed under R99, 4408 under R95 and 931 under W75. To illustrate the reporting variability, they mention that, in 2003-2004, 45.8% of the R99-coded deaths have been classified as unknown, and 48.6% as pending, so that the corresponding deaths could very well have been reported under some other ICD-10 code. Likewise, among the 931 W75-coded deaths of 2003-2004, only 76.4% were characterized as suffocation, so that the classification of the whole ICD-10 coded W75-deaths into SUIDS is also questionable. An update of the counts of [73] based on the latest figures of the Centers for Disease Control and Prevention [CDC] [13] gives for 2013-2014, and children $< 1$, 1674 W75-deaths (corresponding to ASSB), 3108 R95-deaths (corresponding to SIDS) and 2146 R96-98-deaths (corresponding to the other causes of SUIDS). The total cumulated count of 6928 SUIDS deaths for the

two-year period 2013-2014 (close to the 7547 deaths mentioned in [73] for 2003-2004) gives evidence that *the SUIDS is, by far, the leading cause of mortality from unintentional injuries in children.*

As a first conclusion, we may infer from the existing literature that the precise origin of unintentional accidents related to suffocation, choking, asphyxia, foreign body aspiration or ingestion is not clear. One should base a discussion on the gravity of risks on precise counts of observed injuries, when classified into each of the existing codes. This is possible for ICD-10 codes and mortality counts, but there are some ambiguities due to SUIDS accidents where some codes clearly overlap with other codes from the "unintentional suffocation" group. The only way to clarify this situation is to make a factual discussion based on official reports. This will be made in the next section.

## 2. Mortality Data

The following displays are extracted from the data openly available on [66] and [67]. We start with the number of deaths classified into the ICD-10 *Ill defined and unknown causes of mortality* group, comprising the codes R95-R99, among which R95 stands for the *Sudden Infant Death Syndrome* (SIDS).

| <1 Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| R95 | 2453 | 2453 | 2226 | 2063 | 1910 | 1679 | 1563 | 1545 | 1568 | 1500 |
| R96 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R98 | 5 | 2 | 5 | 3 | 5 | 3 | 2 | 2 | 2 | 3 |
| R99 | 1085 | 1117 | 1118 | 918 | 869 | 1061 | 1052 | 1090 | 1117 | 1247 |

Table 1. SUID-related deaths <1 Year - ICD-10 Codes R95-R99 - 2007-2016

| 1 Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| R95 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R96 | 27 | 36 | 32 | 30 | 43 | 31 | 33 | 28 | 26 | 38 |
| R98 | 3 | 1 | 3 | 0 | 0 | 1 | 1 | 1 | 0 | 3 |
| R99 | 93 | 106 | 105 | 101 | 114 | 111 | 114 | 89 | 120 | 112 |

Table 2. SUID-related deaths 1 Year - ICD-10 Codes R95-R99 - 2007-2016

| 2 Years | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| R95 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R96 | 6 | 9 | 5 | 4 | 10 | 4 | 6 | 8 | 1 | 9 |
| R98 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R99 | 38 | 41 | 61 | 29 | 38 | 44 | 45 | 40 | 41 | 41 |

Table 3. SUID-related deaths 2 Years - ICD-10 Codes R95-R99 - 2007-2016

The interpretation of this data is that mortality officially attributed to SIDS (R95) is strictly limited to children of <1 Year. On the other side the ICD-10 code R96 (Other sudden death cause unknown) is excluded for children of <1 Year, but gives significative figures only for children of 1 Year. The ICD-10 code R98 (Death in circumstances where the body of the deceased was found and no cause could be discovered (found dead)) gives constantly small figures at all ages. The remaining ICD-10 code R99 (other ill-defined and unspecified cause of mortality) is very high (of the order of 1000 deaths yearly) for children <1 Year, and remains important for children aged 1 and 2 (respectively of the order of 100 and 50 deaths yearly). These figures will be compared, later-on with that relative to the ICD-10 code W75 (Accidental suffocation or strangulation in bed - ASSB). We recall from [73] that the deaths related to SUIDS comprise primarily injuries covered by the ICD-10 codes R95, R99 and W75.

We next concentrate into the mortality counts for the "unintentional suffocation group", comprising ICD-10 codes W75-W84. The next Table 4 gives data for aggregated age-groups, from 0 to 24 Years, and for Years 2010 to 2015.

| No. of deaths | < 1 | 1-4 | 5-9 | 10-14 | 15-24 |
|---|---|---|---|---|---|
| 2010 | 905 | 134 | 31 | 48 | 126 |
| 2011 | 896 | 144 | 34 | 43 | 127 |
| 2012 | 965 | 138 | 34 | 45 | 124 |
| 2013 | 979 | 161 | 44 | 37 | 116 |
| 2014 | 991 | 120 | 34 | 33 | 107 |
| 2015 | 1125 | 131 | 31 | 26 | 97 |

Table 4. Yearly deaths by age-groups - ICD-10 Codes W75-W84

It follows clearly from the data of Table 4 that mortality concentrates into the first two age classes (<1 and 1-4 Years old). The following data-set will discuss casualty counts for code W44, which groups all deaths due to Foreign Body Ingestion. The data gives yearly counts aggregated for children of 0-19.

| Code | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| W44 | 3 | 1 | 2 | 6 | 4 | 1 | 3 | 2 | 4 | 3 | 2.7 |
| W75 | 697 | 765 | 685 | 650 | 653 | 750 | 857 | 874 | 942 | 888 | 776.1 |
| W76 | 100 | 86 | 92 | 88 | 80 | 80 | 69 | 74 | 64 | 60 | 79.3 |
| W77 | 6 | 7 | 8 | 3 | 1 | 4 | 5 | 3 | 3 | 2 | 4.2 |
| W78 | 26 | 28 | 22 | 24 | 24 | 25 | 22 | 15 | 14 | 11 | 21.1 |
| W79 | 60 | 52 | 54 | 60 | 59 | 58 | 66 | 50 | 63 | 46 | 56.8 |
| W80 | 102 | 92 | 87 | 87 | 111 | 77 | 89 | 67 | 54 | 63 | 82.9 |
| W81 | 10 | 3 | 2 | 4 | 1 | 2 | 0 | 3 | 1 | 0 | 2.6 |
| W83 | 73 | 92 | 60 | 43 | 65 | 26 | 19 | 30 | 10 | 11 | 42.9 |
| W84 | 189 | 225 | 150 | 217 | 175 | 204 | 141 | 104 | 194 | 177 | 177.6 |
| W75-84 | 1263 | 1350 | 1160 | 1176 | 1169 | 1226 | 1268 | 1220 | 1345 | 1258 | 1243.5 |

Table 5. Yearly deaths by ICD-10 Codes W44 and W75-W84 - Ages 0-19

These displayed statistics allow us to draw three important conclusions:

- The number of casualties due to *Foreign Body Ingestion* FBI is surprisingly small (on average, less that 3 deaths/year). This result cannot be

questioned, since the ICD-10 code is non-ambiguous (Foreign body or object entering into or through eye or natural orifice. As mentioned earlier, this gives support to the idea that most FBI injuries are not deadly. Because of this, we will not discuss further FBI and limit our observation to the fact that the mortality risks of the corresponding injuries have been overestimated in the literature.

- Deaths due to ASSB (Accidental Suffocation and Strangulation in bed), ICD-10 code W75, account (on average over the decade 2007-2016) for 62.4% of all casualties for the whole age-group 0-19. This motivates a more detailed analysis, since obviously, ASSB should be limited to very young children. To consider such accidental injuries for children aged (say) 19 is clearly meaningless.

- The number of casualties due to Foreign Body Aspiration FBA, for the age-class 0-19, is split into three main classes of injuries. Those related to choking on food (W79 for about 79 deaths yearly), on vomit (gastric contents) (W78 for about 21 deaths yearly), and on solid (non-food or non-vomit) objects (W80 for about 83 deaths yearly). This is very far from the alarmist statements mentioned earlier (see, e.g., [1, 2, 3, 4]). In words, *the suffocation accidents due to FBA are far from representing a leading cause of mortality in the U.S.*

The next Table 6 extends Table 5 by giving more detailed mortality counts for children aged 0 to 9, and for the aggregated ICD-10 codes W75-W84. We observe from this data that the highest number of deaths correspond to children of age <1 (about 980 yearly deaths). The numbers remain high for children of 1,2,3 and 4 years old (about, respectively, 73, 33, 17 and 12 yearly deaths), and it decreases with age for elder children, down to numbers of deaths in between 6 and 10 yearly.

| Age/Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| <1 | 959 | 1058 | 907 | 905 | 896 | 965 | 979 | 991 | 1125 | 1023 | 980.8 |
| 1 | 92 | 86 | 62 | 72 | 71 | 67 | 87 | 58 | 70 | 62 | 72.7 |
| 2 | 38 | 29 | 34 | 29 | 38 | 40 | 32 | 27 | 36 | 28 | 33.1 |
| 3 | 10 | 20 | 20 | 13 | 23 | 18 | 20 | 15 | 14 | 20 | 17.3 |
| 4 | 9 | 10 | 9 | 20 | 12 | 13 | 22 | 20 | 11 | 8 | 12.5 |
| 5 | 7 | 12 | 6 | 2 | 6 | 9 | 5 | 9 | 7 | 5 | 6.8 |
| 6 | 13 | 2 | 4 | 6 | 7 | 6 | 5 | 7 | 8 | 7 | 6.5 |
| 7 | 4 | 7 | 4 | 5 | 7 | 6 | 12 | 5 | 5 | 6 | 6.1 |
| 8 | 9 | 9 | 4 | 10 | 5 | 3 | 6 | 3 | 5 | 8 | 6.2 |
| 9 | 9 | 11 | 8 | 8 | 9 | 10 | 16 | 10 | 6 | 9 | 9.6 |

Table 6. Yearly deaths 2007-2016 - 0-9 years - ICD-10 Codes W75-W84

Given these results, we are led to consider the impact of ICD-10 code W75 Accidental suffocation and strangulation in bed [ASSB] on the total class of unintentional suffocation accidents. The appropriate data set, extracted from [66], is displayed into the following table.

| Age | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| <1 | 514 | 588 | 669 | 736 | 665 | 629 | 624 | 723 | 819 | 855 | 682.2 |
| 1 | 13 | 19 | 18 | 19 | 12 | 14 | 17 | 15 | 30 | 9 | 16.6 |
| 2 | 2 | 3 | 3 | 1 | 4 | 2 | 4 | 3 | 4 | 4 | 3 |
| 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 3 | 1 | 0 | 1.4 |
| 4 | 2 | 0 | 0 | 1 | 2 | 0 | 1 | 1 | 1 | 0 | 0.8 |
| 5-9 | 0 | 4 | 3 | 2 | 4 | 2 | 4 | 1 | 0 | 3 | 2.3 |
| 10-14 | 2 | 2 | 2 | 2 | 0 | 0 | 1 | 3 | 0 | 1 | 1.3 |
| 15-19 | 1 | 0 | 0 | 1 | 2 | 0 | 1 | 3 | 0 | 1 | 0.9 |

Table 7. Yearly deaths 2005-2014 - 0-19 years - ICD-10 Code W75

The counts in Table 7 leave open some classification questions. Obviously, the mortality data of ASSB pertaining to children of age <1 Year can be included in the class of SUIDS accidents. This corresponds to a 10-year mean of casualties

as high as 96.29% of all deaths within the age-class 0-19. The question is not at all obvious from the data corresponding to higher ages. In particular, the classification of ASSB injuries pertaining to children aged 15-19 into SUIDS is very much questionable. The necessity of a more precise classification is illustrated by these examples, which, fortunately concern very few accidents. This data gives the following conclusion.

- The mortality data pertaining to the ICD-10 code W75 (Accidental suffocation and strangulation in bed [ASSB]) cannot be aggregated with unintentional suffocation data pertaining to other causes. It should be incorporated into the SUIDS group, with some specific treatment allocated to the injuries inflicted to children older than 3.

We now rejoin our discussion concerning *Foreign Body Aspiration*. As mentioned earlier, this concerns the ICD-10 codes W78, W79 and W80. The following tables give the corresponding mortality counts for children aged 0 to 9.

| Age/Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| <1 | 15 | 19 | 9 | 12 | 14 | 12 | 11 | 8 | 8 | 4 | 11.4 |
| 1 | 4 | 5 | 4 | 4 | 3 | 4 | 4 | 1 | 3 | 2 | 3.4 |
| 2 | 1 | 0 | 2 | 4 | 0 | 2 | 3 | 1 | 0 | 0 | 1.3 |
| 3 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0.3 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0.3 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0.2 |
| 6 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0.4 |
| 7 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| 8 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0.3 |
| 9 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0.2 |

Table 8. Yearly deaths 2007-2016 - 0-9 Years - ICD-10 Code W78 (choking on vomit)

| Age/Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| <1 | 13 | 10 | 9 | 12 | 9 | 11 | 9 | 10 | 14 | 7 | 10.4 |
| 1 | 19 | 16 | 13 | 14 | 15 | 16 | 22 | 13 | 20 | 11 | 15.9 |
| 2 | 17 | 10 | 13 | 8 | 13 | 18 | 13 | 9 | 7 | 11 | 11.9 |
| 3 | 2 | 5 | 4 | 5 | 3 | 4 | 5 | 5 | 6 | 5 | 4.4 |
| 4 | 3 | 1 | 1 | 7 | 4 | 1 | 9 | 2 | 4 | 0 | 3.2 |
| 5 | 1 | 0 | 2 | 0 | 1 | 1 | 0 | 2 | 1 | 1 | 0.9 |
| 6 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 3 | 2 | 1 |
| 7 | 0 | 2 | 0 | 1 | 3 | 0 | 0 | 1 | 1 | 0 | 0.8 |
| 8 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 9 | 0 | 0 | 0 | 1 | 2 | 1 | 1 | 1 | 0 | 2 | 0.8 |

Table 9. Yearly deaths 2007-2016 - 0-9 years - ICD-10 Code W79 (choking on food)

| Age/Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|
| <1 | 42 | 33 | 36 | 34 | 48 | 22 | 25 | 22 | 19 | 22 | 30.3 |
| 1 | 22 | 15 | 14 | 17 | 14 | 12 | 16 | 12 | 9 | 12 | 14.3 |
| 2 | 6 | 6 | 5 | 10 | 13 | 10 | 5 | 4 | 7 | 3 | 6.9 |
| 3 | 2 | 4 | 3 | 1 | 11 | 2 | 5 | 2 | 4 | 4 | 3.8 |
| 4 | 1 | 3 | 3 | 6 | 5 | 7 | 6 | 4 | 3 | 2 | 4 |
| 5 | 2 | 4 | 2 | 1 | 3 | 3 | 2 | 0 | 0 | 1 | 1.8 |
| 6 | 5 | 2 | 1 | 0 | 1 | 2 | 2 | 3 | 0 | 3 | 1.9 |
| 7 | 0 | 3 | 1 | 0 | 0 | 1 | 5 | 0 | 2 | 1 | 1.3 |
| 8 | 2 | 1 | 2 | 1 | 0 | 2 | 2 | 1 | 2 | 1 | 1.4 |
| 9 | 5 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1.2 |

Table 10. Yearly deaths 2007-2016 - 0-9 years - ICD-10 Code W80 (choking on non-food items)

The conclusion from the data in Tables 8-10 is as follows.

- Foreign body aspiration [FBA] injuries can be split into three main classes corresponding to the different types of bodies involved.
- The inhalation of gastric contents (vomit) is covered by ICD-10 code W78. The risk is relatively high for children <1 Year (about 11 deaths/yearly). It diminishes by half for children 1-3 (about 5 deaths/yearly). For elder children ($\geq$4) it remains at a very low level (about 2 deaths yearly).
- The inhalation of food is covered by ICD-10 code W78. The risk is relatively high for children of age 0-4 with a peak for 1 year-old children (about 46 deaths yearly). For children of 5 and above, the risk is low (about 5 deaths yearly).
- The inhalation of non-food objects is covered by ICD-10 code W80. The risk is relatively high for children of age 0-3 (about 55 deaths yearly). It diminishes for children aged 4-9 to an overall mean of about 12 deaths yearly.
- These numbers show that the risk of foreign body aspiration (and ingestion) has been very much overestimated in the literature. The error originates from the aggregation of this risk with a series of other related risks not specifically related to FBA and FBI.

## 3. Fatal versus Nonfatal Data

The ratio between fatal and nonfatal data is commonly used to provide estimates of nonfatal injuries given the exact counts of fatal injuries. Some of this data is available in [74, 75]. Unfortunately, the openly available counts are given for grouped data, namely for the *Unintentional Suffocation* injuries, corresponding to the ICD-10 codes W75-W84. In 2017, for a U.S. population of 325,719,178 inhabitants, one so obtains 6,946 deaths, for 57,137 nonfatal injuries. This corresponds to data based on all ages. Naturally for the children age-group, these numbers must be modified (see below). The ratio (nonfatal)/(fatal) is therefore equal to (about) 8.22. Or, likewise, the ratio (fatal)/(nonfatal) is equal to

(about) 12.15%. This is far from the estimations of [13, 19, 35] who are close to multiplying by 10 the official figures of nonfatal unintentional suffocation given in [75]. We note that the latter evaluations correspond to a collection of data made by the National Electronic Injury surveillance System [NEISS] to monitor nonfatal injuries treated in U.S. hospital emergency departments. Obviously, the ratio (nonfatal)/(fatal) must vary with respect of the different ICD-10 codes. For example, those who refer to SUIDS will be equal to 0, all accidents being, by definition, fatal. For this reason, we can only offer a thumb-rule to evaluate the yearly number of FBA nonfatal injuries. Below are given more detailed displays.

| Age | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| 00-04 | 1108 | 1203 | 1032 | 1039 | 1040 | 1103 | 1140 | 1111 | 1256 |
| 05-09 | 42 | 41 | 26 | 31 | 34 | 34 | 44 | 34 | 31 |
| 10-14 | 60 | 50 | 41 | 48 | 43 | 45 | 37 | 33 | 26 |
| 15-19 | 53 | 56 | 61 | 58 | 52 | 44 | 47 | 42 | 32 |
| Total | 1263 | 1350 | 1160 | 1176 | 1169 | 1226 | 1268 | 1220 | 1345 |

Table 11. Yearly deaths 2007-2015 - 0-19 years - ICD-10 Codes W75-W84

| Age | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| 00-04 | 12236 | 10543 | 11820 | 13804 | 16429 | 17603 | 17679 | 1256 | 1141 |
| 05-09 | 41 | 26 | 31 | 34 | 34 | 44 | 34 | 31 | 35 |
| 10-14 | 50 | 41 | 48 | 43 | 45 | 37 | 33 | 26 | 39 |
| 15-19 | 56 | 61 | 58 | 52 | 44 | 47 | 42 | 32 | 43 |
| Total | 1350 | 1160 | 1176 | 1169 | 1226 | 1268 | 1220 | 1345 | 1258 |

Table 12. Nonfatal Injuries 2007-2015 - 0-19 years - ICD-10 Codes W75-W84

By considering the age-groups in Tables 11-12, we conclude that the ratio (nonfatal injuries)/(fatal injuries) is of the order of 50 for the age-group 5-19.

## 4. Conclusion

The accidental data provided in the present paper illustrates the urgent need of a precise nomenclature of the types of injuries to be considered. On the whole, the only precise available statistics are the mortality counts pertaining to each ICD code. The number of non-fatal injuries can then be deduced from these counts given appropriate estimations of the ratio (Non-fatal injuries)/(Fatal injuries). To achieve a proper epidemiological analysis, it is essential for the ICD nomenclature in force to avoid any possible ambiguity, such as that induced by the possibility of reporting an accident under different ICD codes. The case of the Sudden Unexpected Infant Death Syndrome [SUIDS] is a perfect example of the problem. By reporting a number of SUIDS (but not all) as Accidental Suffocation and Strangulation in Bed [ASSB], then, by aggregating the corresponding ICD-10 code W75 into the Unintentional Suffocation group W75-W84, the official organisms responsible for accidental statistics have propagated a distorted view of the real situation of accidental risks. Because of this, the risks of Foreign Body Aspiration and Ingestion [FBA-FBI] has been largely overestimated, giving rise to unappropriate alarms. Clearly, the official organisms collecting accidental data cannot be considered as responsible for this major error, but the conclusion is that one should remain cautious in the future of possible false alarms due to the nomenclature of accidents. We hope sincerely that the newer versions of ICD codes will bring improvements to the unfortunate oversights brought by ICD-9 and ICD-10 coding systems. The simple comparison of ICD-10 codes with ICD-10 CM and ICD-10 PCS codes shows that these three different coding systems are not fully coherent. Some efforts should be made to correct this situation, otherwise they should remain mutually incompatible.

## References

[1] Safe Kids Worldwide, Overview of global childhood injury morbidity and mortality fact sheet 2014, `https://www.safekids.org/fact-sheet/`

overview-global-childhood-injury-morbidity-and-mortality-fact-sheet-2014-pdf/, Last accessed on 2019-05-01 (2015).

[2] N. Borse, J. Gilchrist, A. Dellinger, R. Rudd, M. Ballesteros, D. Sleet, CDC Childhood Injury Report: Patterns of Unintentional Injuries among 0-19 Years Olds in the United States, 2000-2006, atlanta (GA): Centers for Disease Control and Prevention, National Center for Injury Prevention and Control https://www.cdc.gov/safechild/pdf/cdc-childhoodinjury.pdf, Last accessed on 2019-05-01 (2008).

[3] CDC - Centers for Disease Control and Prevention WISQARS - Web-based Injury Statistics Query and Reporting System National Center for Injury Prevention and Control, 10 Leading Causes of Injury Deaths by Age Group Highlighting Unintentional Injury Deaths, United States - 2017, https://www.cdc.gov/injury/wisqars/LeadingCauses.html, Last accessed on 2019-05-01 (2017).

[4] Nationwide Children's Hospital, Choking is a leading cause of injury and death among children, www.sciencedaily.com/releases/2010/02/100226212559.htm, Last accessed on 2019-05-01 (28 February 2010).

[5] F. Foltran, D. Gregori, D. Passàli, L. Bellussi, G. Caruso, F. Passàli, G. Passàli, the ESFBI Study Group, Toys in the upper aerodigestive tract: Evidence on their risk as emerging from the ESFBI study, Auris Nasus Larynx 38 (2011) 612–617.

[6] D. Gregori, The Susy Safe Project: A web-based registery of foreign body injuries in children, International Journal of Pediatric Otorhinolaryngology 70 (2006) 1663–1664.

[7] F. Ruiz, G. Mallory, S. Torrey, A. Hoppin, Airway foreign bodies in children, UpToDate (2018) 1–15, https://www.uptodate.com/contents/airway-foreign-bodies-in-children, Last accessed on 2019-05-01.

[8] B. Arjan, A. Yusof, A. Millar, T. S. S. W. Group, Food foreign body injuries, International Journal of Pediatric Otorhinolaryngology 76S (2012) S20–S25.

[9] F. Baharloo, F. Veyckemans, C. Francis, M.-P. Biettlot, D. Rodenstein, Tracheobronchial foreign bodies - presentation and management in children and adults, CHEST 115 (5) (1999) 1357–1362.

[10] A. Baram, H. Sherzad, S. Saeed, F. Kakamad, A. Hamawandi, Tracheobronchial foreign bodies in children: the role of emergency rigid bronchoscopy, Global Pediatric Health 4 (2017) 1–6. doi:10.1177/2333794X17743663.

[11] P. Berchialla, L. Bellussi, A. Castella, S. Snidero, D. Passali, D. Gregori, Modeling the risk: Innovative approaches to understand and quantify the risk of severe FB injury, International Journal of Pediatric Otorhinolaryngology 76S (2012) S33–S38.

[12] R. Black, D. Johnson, M. Matlack, Bronchoscopic removal of aspirated foreign bodies in children, Journal of Pediatric Surgery 29 (5) (1994) 682–684.

[13] A. Boufersaoui, L. Smati, K. Benhalla, R. Boukari, S. Smail, K. Anik, R. Aouameur, H. Chaouche, M. Baghriche, Foreign body aspiration in children: Experience from 2624 patients, International Journal of Pediatric Otorhinolaryngology 77 (2013) 1683–1688.

[14] F. Brkić, Š. Umihanić, Tracheobronchial foreign bodies in children - experience at ORL clinic Tuzla, 1995–2004, International Journal of Pediatric Otorhinolaryngology 71 (2007) 909–915.

[15] X. Chen, C. Zhang, Foreign body aspiration in children: Focus on the impact of delayed treatment, International Journal of Pediatric Otorhinolaryngology 71 (2017) 111–115.

[16] J. Cheng, B. Liu, A. Farjat, J. Routh, The public health resource utilization impact of airway foreign bodies in children, International Journal of Pediatric Otorhinolaryngology 96 (2017) 68–71.

[17] H. Chew, H. Tan, Airway foreign body in children, International Journal of Clinical Medicine 3 (2012) 655–660.

[18] C. de Oliveira, J. de Almeida, E. Troster, F. Vaz, Complications of tracheobronchial foreign body aspiration in children: Report of 5 cases and review of the literature, Revista do Hospital das Clínicas Universidade de São Paulo Hospital das Clínicas 57 (3) (2002) 108–111.

[19] S. Eren, A. Balci, B. Dikici, M. Doblan, M. Eren, Foreign body aspiration in children: Experience of 1160 cases, Annals of Tropical Paediatrics 23 (1) (2003) 31–37.

[20] F. Foltran, S. Ballali, F. Passali, E. Kern, B. Morra, G. Passali, P. Berchialla, M. Lauriello, D. Gregori, Foreign bodies in the airways: A meta-analysis of published papers, International Journal of Pediatric Otorhinolaryngology 76S (2012) S12–S19.

[21] F. Foltran, P. Berchialla, D. Gregori, A. Pitkäranta, I. Slapak, J. Jakubíková, L. Bellussi, D. Passali, Stationery injuries in the upper aerodigestive system: Results from the Susy Safe Project, International Journal of Pediatric Otorhinolaryngology 76S (2012) S67–S72.

[22] R. Higo, Y. Matsumoto, K. Ichimura, K. Kaga, Foreign bodies in the aerodigestive tract in pediatric patients, Auris Nasus Larynx 30 (2003) 397–401.

[23] O. Higuchi, Y. Adachi, T. Ichimaru, M. Asai, K. Kawasaki, Foreign body aspiration in children: A nationwide survey in Japan, International Journal of Pediatric Otorhinolaryngology 73 (2009) 659–661.

[24] H. Hui, L. Na, C. Zhijun, Z. Fugao, S. Yan, Z. Niankai, C. Jinggjing, Therapeutic experience from 1428 patients with pediatric tracheobronchial foreign body, Journal of Pediatric Surgery 43 (2008) 718–721.

[25] I. Kim, N. Shapiro, N. Bhattacharyya, The national cost burden of bronchial foreign body aspiration in children, Laryngoscope 125 (2015) 1221–1224.

[26] M. Mallick, Tracheobronchial foreign body aspiration in children: A continuing diagnostic challenge, African Journal of Paediatric Surgery 11 (3).

[27] M. Mohammad, M. Saleem, M. Mahseeri, I. Alabdallat, A. Alomari, A. Za'atreh, I. Qudaisat, A. Shufidat, M. Alzoubi, Foreign body aspiration in children: A study of children who lived or died following aspiration, International Journal of Pediatric Otorhinolaryngology 98 (2017) 29–31.

[28] H. Rodriguez, G. Passali, D. Gregori, Management of foreign bodies in the airway and oesophagus, International Journal of Pediatric Otorhinolaryngology 76S (2012) S84–S91.

[29] A. Salih, M. Alfaki, D. Alam-Elhuda, Airway foreign bodies: A critical review for a common pediatric emergency, World Journal of Emergency Medicine 7 (1) (2016) 5–12.

[30] R. Shah, A. Patel, L. Lander, S. Choi, Management of foreign bodies obstructing the airway in children, Archives of Otorhinolaryngology - Head and Neck Surgery 136 (4) (2010) 373–379.

[31] A. Shivakumar, A. Naik, K. Prashanth, K. Shetty, D. Praveen, Tracheobronchial foreign bodies, Indian Journal of Pediatrics 70 (10) (2003) 793–797.

[32] I. Slapak, F. Passali, A. Gulati, the Susy Safe Working Group, Non food foreign body injuries, International Journal of Pediatric Otorhinolaryngology 76S (2012) S26–S32.

[33] H. Tan, K. Brown, T. McGill, M. Kenna, D. Lund, G. Healy, Airway foreign bodies (FB): A 10-year review, International Journal of Pediatric Otorhinolaryngology 56 (2000) 91–99.

[34] H.-J. Tseng, T. Hanna, W. Shuaib, F. Khosa, K. Linnau, Imaging foreign bodies: Ingested, aspirated and inserted, Annals of Emergency Medicine 66 (6) (2015) 570–582.

[35] I. Paşaoğlu, R. Doğan, M. Demircin, Bronchoscopic removal of foreign bodies in children: Retrospective analysis of 822 cases, Thoracic Cardiovascular Surgery 39 (2) (1991) 95–98.

[36] D. Gregori, B. Morra, A. Gulati, Magnetic FB injuries: An old yet unresolved hazard, International Journal of Pediatric Otorhinolaryngology 76S (2012) S42–S48.

[37] G. Triadafilopoulos, J. Saltzman, S. Grover, Ingested foreign bodies and food impactions in adults, UpToDate (2018) 1–15, `https://www.uptodate.com/contents/ingested-foreign-bodies-and-food-impactions-in-adults`, Last accessed on 2019-05-01.

[38] R. Altkorn, X. Chen, S. Milkovich, D. Stool, G. Rider, C. Bailey, A. Haas, K. Riding, S. Pransky, J. Reilly, Fatal and non-fatal food injuries among children (aged 0–14 years), International Journal of Pediatric Otorhinolaryngology 72 (2008) 1041–1046.

[39] P. Ambe, S. Weber, M. Schauer, W. Knoefel, Swallowed foreign bodies in adults, Deutsches Arzteblatt International 109 (50) (2012) 2869–875.

[40] K. Blaho, K. Merigian, S. Winbery, L. Park, M. Cockrell, Foreign body ingestions in the emergency department: case reports and review of treatment, Journal of Emergency Medicine 16 (1) (1998) 21–26.

[41] W. Cheng, P. Tam, Foreign body ingestion in children: Experience with 1,265 cases, Journal of Pediatric Surgery 34 (10) (1999) 1472–1476.

[42] S. Ikenberry, T. Jue, V. Appelaneni, S. Benerjee, T. Ben-Menachem, A. Decker, R. Fanelli, L. Fisher, N. Fukami, M. Harrison, R. Jain, K. Khan,

M. Krinsky, J. Maple, R. Sharaf, L. Strohmeyer, J. Dominitz, A.G.S.E. Standards of Practice Committee, Guideline - Management of ingested foreign bodies and food impactations, Gastrointestinal Endoscopy 73 (6) (2011) 1085–1091. doi:10.1016/j.gie.2010.11.010.

[43] S. Jayachandra, G. Eslick, A systematic review of paediatric foreign body ingestion: Presentation, complication, and management, International Journal of Pediatric Otorhinolaryngology 77 (2013) 311–317.

[44] T. Kramer, K. Reiding, l.J. Salkeld, Tracheobronchial and esophagus foreign bodies in the pediatric population, Journal of Otorhinolaryngology 15 (6) (1986) 355–358.

[45] M. Louie, S. Bradin, Foreign body ingestion and aspiration, Pediatric Review 30 (8) (2009) 295–301.

[46] G. Singh, S. Sharma, S. Khurade, S. Gooptu, Ingested foreign bodies in children: A report of two cases, Journal of Family Medicine and Primary Care 3 (4) (2014) 452–455. doi:10.4103/2249-4863.148148.

[47] N. Velitchkov, G. Grigorov, J. Losanoff, K. Kjossev, Ingested foreign bodies of the gastrointestinal tract: Retrospective analysis of 542 cases, World Journal of Surgery 20 (1996) 1001–1005.

[48] F. Rimell, A. Thorme, S. Stool, J. Reilly, G. Rider, D. Stool, C. Wilson, Characteristics of objects that cause choking in children, JAMA 274 (1995) 1763–1766.

[49] M. Chapin, L. Rochette, J. Annest, T. Haileyesus, K. Conner, G. Smith, Nonfatal choking on food among children 14 years of younger in the United States, 2001–2009, Pediatrics 132 (2) (2013) 275–281.

[50] D. Sidell, I. Kim, T. Coker, C. Moreno, N. Shapiro, Food choking hazards in children, International Journal of Pediatric Otorhinolaryngology 77 (2013) 1940–1946.

[51] R. Sola Jr, E. Rosenfeld, Y. Yu, S. S. Peter, S. Shah, Magnet foreign body ingestion: rare occurrence but big consequences, Journal of Pediatric Surgery 53 (9) (2018) 1815–1819. doi:10.1016/j.pedsurg.2017.08.013.

[52] S. Ambrose, N. Raol, Pediatric airway foreign body, Operative Techniques in Otolaryngology 28 (2017) 265–269.

[53] T. de Koning, F. Foltran, D. Gregori, Fostering design for avoiding small parts in commonly used objects, International Journal of Pediatric Otorhinolaryngology 76S (2012) S57–S60.

[54] T. Sih, C. Bunnag, S. Ballali, M. Lauriello, L. Bellussi, Nuts and seed: A natural yet dangerous foreign body, International Journal of Pediatric Otorhinolaryngology 76S (2012) S49–S52.

[55] M. Peden, K. Oyegbite, J. Ozanne-Smith, A. Hyder, C. Branche, A. Rahman, F. Rivara, K. Bartolomeos, World report on child injury prevention, WHO Library Cataloguing-in-Publication Data - World Health Organization, 2008.

[56] T. Vos, the Global Burden of Disease Pediatrics Collaboration, Global and national burden of diseases and injuries among children and adolescents between 1990 and 2013 Findings from the global burden of disease 2013 study, JAMA Pediatrics 170 (3) (2016) 267–287. doi:10.1001/jamapediatrics.2015.4276.

[57] D. Gregori, D. Passali, Foreign bodies injuries: A strong unique pathway linking ORL and public health, International Journal of Pediatric Otorhinolaryngology 76S (2012) S1.

[58] M. Pavitt, J. Nevett, L. Swanton, M. Hind, M. Polkey, M. Green, N. Hopkinson, London ambulance source data on choking incidence for the calendar year 2016: an observational study, BMJ Open Respiratory Research 138 (2017) 1–4. doi:10.1136/bmjresp-2017-000215.

[59] D. Passali, Foreign body injuries: The urgent need for updating the field, International Journal of Pediatric Otorhinolaryngology 76S S2.

[60] The Susy Safe Working Group, The Susy Safe project overview after the first four years of activity, International Journal of Pediatric Otorhinolaryngology 76S (2012) S3–S11.

[61] T. Adjeso, M. Damah, J. Murphy, T. Anyomih, Foreign body aspiration in northern Ghana: A review of pediatric patients, International Journal of Otolaryngology 2017 (1–4). doi:10.1155/2017/1478795.

[62] A. Chinski, F. Foltran, D. Gregori, S. Ballali, D. Passali, L. Bellussi, Foreign bodies in children: A comparison between Argentina and Europe, International Journal of Pediatric Otorhinolaryngology 76S (2012) S76–S79.

[63] C. Chotigavanich, S. Ballali, F. Foltran, D. Passali, L. Bellussi, D. Gregori, the ESFBI Study Group, Foreign bodies injuries in children: Analysis of Thailand data, International Journal of Pediatric Otorhinolaryngology 76S (2012) S80–S83.

[64] C. Sarafoleanu, S. Ballali, D. Gregori, L. Bellussi, D. Passali, Retrospective study on Romanian foreign body injuries in children, International Journal of Pediatric Otorhinolaryngology 76S (2012) S73–S75.

[65] World Health Organization, International Statistical Classification of Diseases and Related Health Problems - 10th Revision - Volume 2 Instruction Manual, Edition 2010, https://icd.who.int/browse10/Content/statichtml/ICD10Volume2_en_2010.pdf, Last accessed on 2019-05-01 (2010).

[66] World Health Organization, WHO Mortality Database, http://apps.who.int/healthinfo/statistics/mortality/whodpms/help/help.htm, Last accessed on 2019-05-01 (2019).

[67] Centers for Disease Control and Prevention, Fatal Injury Reports, National, Regional and State, 1981-2017, https://webappa.cdc.gov/sasweb/ncipc/mortrate.html, Lasr accessed on 2019-05-01 (2019).

[68] CDC - Centers for Disease Control and Prevention National Center for Health Statistics, International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM), https://www.cdc.gov/nchs/icd/icd10cm.htm#FY2019releaseofICD-10-CM, Last accessed on 2019-05-01 (2019).

[69] World Health Organization, International Statistical Classification of Diseases and Related Health Problems 10th Revision - ICD-10 Version:2016, https://icd.who.int/browse10/2016/en, Last accessed on 2019-05-01 (2016).

[70] CMS.gov Centers for Medicare and Medicaid Services, The 2019 ICD-10 Procedure Coding System (ICD-10-PCS), https://www.cms.gov/Medicare/Coding/ICD10/2019-ICD-10-PCS.html, Last accessed on 2019-05-01 (2019).

[71] Task Force on Sudden Infant Death Syndrome, The changing concept of sudden infant death syndrome: Diagnostic coding shift, controversies regarding the sleeping environment and new variables to consider in reducing risks, Pediatrics 116 (2005) 1245–1255.

[72] R.Y. Moon and AAP Task Force on Sudden Infant Death Syndrome, SIDS and other sleep-related infant deaths: evidence base for 2016 updated recommendations for a safe infant sleeping environment, Pediatrics 138 (2016) 1–34.

[73] S. Kim, C. Shapiro-Mendoza, S. Chu, L. Camperlengo, R. Anderson, Differentiating cause-of-death terminology for deaths coded as sudden infant death syndrome, accidental suffocation, and unknown cause: an investigation using US death certificates, 2003-2004, Journal of Forensic Sciences 57 (364–369).

[74] Centers for Disease Control and Prevention, Injury Center - Data and Statistics(WISQARS) - WISQARS Data Visualization, https://www.cdc.gov/injury/wisqars/fatal.html, Last accessed on 2019-05-01 (2019).

[75] Centers for Disease Control and Prevention, Injury Center - Data and Statistics(WISQARS) - Nonfatal Injury 2000-2017, https://www.cdc.gov/injury/wisqars/fatal.html, Last accessed on 2019-05-01 (2019).