Reporting of Aspiration Pneumonia or Choking as a Cause of Death in Patients Who Died With Stroke

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Background and Purpose—It is not known how many stroke patients die from fatal pulmonary complications such as aspiration pneumonia (AP) and choking each year in the United States. This study aimed to determine the frequency of reporting of AP or choking as a cause of death on death certificates with mention of stroke in the United States as a proxy measure of the incidence of dying from AP or choking among patients with stroke.

Methods—We used multiple-cause mortality data for the years 2001 to 2010 to identify death certificates with mention of stroke (International Classification of Diseases, Tenth Revision code I60–I69), AP (International Classification of Diseases, Tenth Revision code J69), and choking (International Classification of Diseases, Tenth Revision code W78–W80) for analysis.

Results—Of 2,424,379 death certificates with mention of stroke in the United States between 2001 and 2010, 5.1% (n=124,503) reported AP as a cause of death, and 1.5% (n=36,997) reported choking as a cause of death. However, if we confined the analysis to autopsy-confirmed cases, the frequency decreased to 1.3% (555/42,732) and 1.3% (541/42,732), respectively. The adjusted odds ratios of reporting AP or choking as a cause of death were higher among men, increased with age, and were higher among decedents who died in a nursing home/long-term care.

Conclusions—The estimated incidence of dying from AP and choking among patients who died with stroke was 5% (~12,000 deaths per year) and 1% (~3,700 deaths per year) according to information reported on death certificates. Efforts are needed to reduce the number of deaths from these 2 preventable complications. (Stroke. 2013;44:1182-1185.)

Key Words: aspiration pneumonia ■ choking ■ death certificate ■ stroke

Dysphagia (difficulty in swallowing) after acute stroke is common and increases the risk of pulmonary complications such as aspiration pneumonia (AP) and choking and the related mortality.1-5 However, it is not known how many stroke patients die from AP or choking each year in the United States. The main reason for the lack of this information is that the traditional cause–specific mortality is tabulated based on the underlying cause of death (COD), which is defined by the World Health Organization as the disease or injury that initiated the train of morbid events leading directly to death.5 In the following example, stroke would be selected as the underlying COD for mortality tabulation, and the information on choking or AP would not be available in the underlying COD mortality data.

(1) Aspiration pneumonia
(2) Choking by food
(3) Stroke

To remedy this limitation, researchers suggest the use of multiple COD data to illustrate the complications leading to death.7,8 This study aimed to determine the frequency of reporting of AP or choking as a COD on death certificates with mention of stroke using multiple-cause mortality files of the United States for years 2001 to 2010 as a proxy measure of the incidence of dying from AP or choking among patients with stroke.

Methods

Data Source
We used the multiple COD database of Centers for Disease Control and Prevention Wide-ranging Online Data for Epidemiological Research (CDC WONDER) for the years 2001 to 2010 to identify death certificates with mention of stroke (International Classification of Diseases, Tenth Revision code I60–I69), AP (International Classification of Diseases, Tenth Revision code J69), and choking (International Classification of Diseases, Tenth Revision code...
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W78–W80) for analysis. CDC WONDER is an easy-to-use, menu-driven system that makes the information resources of the Centers for Disease Control and Prevention available to public health professionals and the public at large.9

Analysis

In the first part of the analysis, we first calculated the frequency of reporting of AP or choking as the COD on death certificates with mention of stroke by year, sex, age, race, and place of death. We then computed the odds ratios and 95% confidence intervals for the reporting of AP or choking as the COD based on the logistic regression model, adjusting for year, sex, age, race, and place of death. In the second part of the analysis, we confined the analyses to deaths with autopsy confirmation only. Autopsy information was available beginning in 2003.

Results

Of 2,424,379 death certificates with mention of stroke in the United States between 2001 and 2010, 5.1% (n=124,503) reported AP as a COD, 1.5% (n=36,997) reported choking as a COD, and 0.51% (n=12,439) reported both AP and choking.

The adjusted odds ratios of reporting AP or choking as a COD decreased from 2001 to 2010, were higher among men, and increased with age (Table 1).

However, if we confined the analysis to autopsy-confirmed cases only, the percentage of reporting of AP, choking, and both as COD decreased to 1.3% (555/42,732), 1.3% (541/42,732), and 0.12% (53/42,732), respectively. The adjusted odds ratios of reporting AP or choking as a COD in autopsy-confirmed cases were higher among men, increased with age, and were higher among decedents who died in a nursing home/long-term care (Table 2).

Discussion

This is the first study to attempt to estimate how many stroke patients die from AP or choking. The findings of this study indicated that of ~240,000 patients who died with stroke each year in the United States during the past decade, ~12,000 were reported as dying from AP, and 3700 were reported as dying from choking on death certificates by certifying physicians. Fortunately, the risk of death from AP, or choking declined from 2001 to 2010. However, we found that the risk was higher among men, increased with age, and was higher among decedents who died in a nursing home/long-term care.

The incidence estimated in this study was based on the information reported on death certificates by certifying physicians. However, it is sometimes very difficult for certifying physicians to assign a stroke-related COD.10–12 For example, choking is a symptom involving something penetrating the airway and is difficult to distinguish from coughing.

Table 1. Frequency and Adjusted OR and 95% CIs of Reporting AP or Choking as a COD on Death Certificates With Mention of Stroke by Year, Sex, Age, Race, and Place of Death in the United States, 2001 to 2010

<table>
<thead>
<tr>
<th>With Mention of Stroke</th>
<th>Reporting AP as COD</th>
<th>Reporting Choking as COD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Total</td>
<td>2,424,379</td>
<td>124,503</td>
</tr>
<tr>
<td>Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001–2002</td>
<td>548,075</td>
<td>32,088</td>
</tr>
<tr>
<td>2003–2004</td>
<td>517,733</td>
<td>28,494</td>
</tr>
<tr>
<td>2005–2006</td>
<td>474,030</td>
<td>23,424</td>
</tr>
<tr>
<td>2007–2008</td>
<td>451,056</td>
<td>20,831</td>
</tr>
<tr>
<td>2009–2010</td>
<td>433,485</td>
<td>19,148</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>999,956</td>
<td>65,777</td>
</tr>
<tr>
<td>Women</td>
<td>1,424,423</td>
<td>58,726</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–44 y</td>
<td>55,232</td>
<td>6,22</td>
</tr>
<tr>
<td>45–64 y</td>
<td>272,877</td>
<td>7,358</td>
</tr>
<tr>
<td>65–74 y</td>
<td>347,617</td>
<td>16,534</td>
</tr>
<tr>
<td>≥75 y</td>
<td>1,748,590</td>
<td>99,988</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
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<tr>
<td>White</td>
<td>2,051,594</td>
<td>106,781</td>
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<tr>
<td>Black</td>
<td>304,617</td>
<td>13,790</td>
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<tr>
<td>Others</td>
<td>68,168</td>
<td>3,932</td>
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<tr>
<td>Place of death</td>
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<td></td>
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<tr>
<td>Inpatient</td>
<td>1,065,818</td>
<td>63,358</td>
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<tr>
<td>NH/LTC</td>
<td>783,431</td>
<td>43,675</td>
</tr>
<tr>
<td>Home</td>
<td>325,116</td>
<td>8,817</td>
</tr>
<tr>
<td>Others</td>
<td>250,014</td>
<td>8,653</td>
</tr>
</tbody>
</table>

AP indicates aspiration pneumonia; CI, confidence interval; COD, cause of death; NH/LTC, nursing home/long-term care; and OR, odds ratio.
infections are common after stroke and are sometimes not only because of aspiration but also because of impaired immunity, hypostasis, and hypoventilation. In some places, all pneumonia after stroke will be described as AP, even if there is no direct evidence of aspiration.

The estimated incidence of reporting of AP as a COD was 5% according to all death certificates and was 1% according to autopsy-confirmed cases. One possible explanation of this discrepancy is that, in most cases, it is not necessary to perform an autopsy to determine AP or choking as a COD. Only in a small number of cases, the autopsy is needed to confirm whether the AP or choking was due to what kind of objects (such as vomitus, milk, or foods). As a result, the autopsy rate was only 0.6% among deceased reporting of AP as a COD and 1.9% among deceased reporting of choking as a COD.

Regarding the denominator, because of the improvement in the acute care of stroke patients, more stroke patients may die from AP or choking many months after the occurrence of stroke. The attending physician, therefore, does not mention stroke at all on the death certificate, resulting in under-reporting of stroke as the underlying COD. This might be one of the possible reasons for which chronic lower respiratory diseases (mainly lower respiratory infection) rose from the fourth leading COD to the third leading COD since 2008.13

The findings of this study suggest a decline in the frequency of reporting AP or choking as a COD on death certificates with mention of stroke from 2001 to 2010. This might be because of the increase in implementation of dysphagia screening and management programs in institutions caring for patients with stroke.14,15 However, given that most healthcare workers in stroke services are now aware of the importance of swallow screening and management, there may be an increasing reticence to attribute deaths to choking or aspiration because these are increasingly seen as unacceptable. Caution should be exercised in interpreting the findings.

In conclusion, despite the above-mentioned limitations, this study suggests the potential for using multiple-cause mortality data to estimate the number of deaths from fatal pulmonary complications among patients who died with stroke. The estimated incidence of dying from AP and choking among patients who died with stroke was 5% (~12000 deaths per year) and 1% (~3700 deaths per year) according to information reported on death certificates. Efforts are needed to reduce the number of deaths from these 2 preventable complications.

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**Disclosures**

None.

**References**


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