

# Abusive Head Injuries among Arizona Infants And Young Children, 2006-2013



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Abusive head injury fatalities were identified in Arizona's Child Fatality Review annual reports. Non-fatal hospitalizations and emergency department visits due to abusive head injuries (shaken infant or shaken impact syndrome) were identified using methods from a study conducted by Dias *et al.* (2005).<sup>1</sup> Infants and children under the age of two years with a code for shaken infant syndrome (995.55) in any diagnostic fields were included. Additionally, cases with a diagnostic code for skull fracture or intracranial injury (800-804.9), retinal hemorrhage (362.81), or intracranial hemorrhage (853.0, 853.1) with an external cause of injury code for known or suspected homicide/assault (E960-E968 and E980-E989) were included.

In the study by Dias and colleagues (2005), all suspected cases of abusive head injury were reviewed in detail by a multidisciplinary medical team to confirm the nature of the inflicted injuries. For this report on abusive head injury in Arizona during 2006-2013, the number of non-fatal hospitalizations represents an estimate because an extensive review of medical records was not done.

## **2006**

There were 22 non-fatal hospitalizations in 2006. Sixty-four percent were males (n=14) and 36 percent were females (n=8). The children stayed a total of 244 days in the hospital, and the mean length of stay was 11 days. The hospital charges totaled \$1,630,998, and AHCCCS/Medicaid was the expected payer for the majority of these hospitalizations (68 percent, n=15). Of the cases for which AHCCCS/Medicaid was the expected payer, the average cost per hospitalization was \$108,733. There were five emergency department visits for abusive head injuries. According to the 14<sup>th</sup> Annual Child Fatality Review Program Report, there were nine confirmed deaths due to shaken infant syndrome in 2006.<sup>2</sup>

## **2007**

There were 22 non-fatal hospitalizations in 2007. Fifty-five percent were males (n=12) and 45 percent were females (n=10). The children stayed a total of 248 days in the hospital, and the mean length of stay was 11 days. The hospital charges totaled \$1,566,940, and AHCCCS/Medicaid was the expected payer for the majority of these hospitalizations (68 percent, n=15). Of the cases for which AHCCCS/Medicaid was the expected payer, the average cost per hospitalization was \$80,312. There were six emergency department visits for abusive head injuries. According to the Child Fatality Review Program, there were 11 confirmed deaths due to shaken infant syndrome in 2007.<sup>2</sup>

## **2008**

There were 42 non-fatal hospitalizations in 2008. Sixty-two percent were males (n=26) and 38 percent were females (n=16). The children stayed a total of 492 days in the hospital, and the mean length of stay was 12 days. The hospital charges totaled \$3,664,454, and AHCCCS/Medicaid was the expected payer for the majority of these

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<sup>1</sup> Dias MS, Smith K, deGuehery K, *et al.* Preventing Abusive Head Trauma among Infants and Young Children: A Hospital-Based, Parent Education Program. *Pediatrics.* 2005;115:e470-e477.

hospitalizations (71 percent, n=30). Of the cases for which AHCCCS/Medicaid was the expected payer, the average cost per hospitalization was \$70,210. There were four emergency department visits for abusive head injuries. According to the Child Fatality Review Program, there were five confirmed deaths due to shaken infant syndrome in 2008, and two confirmed cases of abusive head trauma where shaking could not be confirmed.

## **2009**

There were 62 non-fatal hospitalizations in 2009. Sixty-one percent were males (n=38) and 39 percent were females (n=24). The children stayed a total of 476 days in the hospital, and the mean length of stay was 8 days. The hospital charges totaled \$4,241,327, and AHCCCS/Medicaid was the expected payer for the majority of these hospitalizations (77 percent, n=48). Of the cases for which AHCCCS/Medicaid was the expected payer, the average cost per hospitalization was \$44,932. There were eight emergency department visits for abusive head injuries. According to the Child Fatality Review Program, there were seven confirmed deaths due to shaken infant syndrome in 2009, and four confirmed cases of abusive head trauma where shaking could not be confirmed.

## **2010**

There were 29 non-fatal hospitalizations in 2010, representing a sharp decrease from 2009. Forty-five percent were males (n=13) and 55 percent were females (n=16). The children stayed a total of 220 days in the hospital, and the mean length of stay was 8 days (median= 4 days). The hospital charges totaled \$2,256,718, and AHCCCS/Medicaid was the expected payer for the majority of these hospitalizations (86 percent, n=25). Of the cases for which AHCCCS/Medicaid was the expected payer, the average cost per hospitalization was \$77,929 (median=\$27,389). There were nine emergency department visits for abusive head injuries. According to the Child Fatality Review Program, there were four confirmed deaths due to shaken infant syndrome in 2010, and four confirmed cases of abusive head trauma where shaking could not be confirmed.

## **2011**

There were 44 non-fatal hospitalizations in 2011. Forty-five percent were males (n=20) and 55 percent were females (n=24). The children stayed a total of 294 days in the hospital, and the mean length of stay was 7 days (median= 4 days). The hospital charges totaled \$3,054,575, and AHCCCS/Medicaid was the expected payer for the majority of these hospitalizations (75 percent, n=33). Of the cases for which AHCCCS/Medicaid was the expected payer, the average cost per hospitalization was \$74,741 (median=\$39,571). There were two emergency department visits for abusive head injuries. According to Child Fatality Review, there were twelve confirmed deaths due to shaken infant syndrome in 2011, and five cases of abusive head trauma where shaking could not be confirmed.

## **2012**

There were 28 non-fatal hospitalizations in 2012. Seventy-five percent were males (n=21) and 25 percent were females (n=7). The children stayed a total of 214 days in the hospital, and the mean length of stay was 8 days (median= 3 days). The hospital charges totaled \$2,141,604 and AHCCCS/Medicaid was the expected payer for the

majority of these hospitalizations (75 percent, n=21). Of the cases for which AHCCCS/Medicaid was the expected payer, the average cost per hospitalization was \$83,463 (median=\$49,975). According to Child Fatality Review, there were six confirmed deaths due to shaken infant syndrome in 2012, and three cases of abusive head trauma where shaking could not be confirmed.

### 2013

There were 41 non-fatal hospitalizations in 2013. Sixty-one percent were males (n=25) and 39 percent were females (n=16). The children stayed a total of 409 days in the hospital, and the mean length of stay was 10 days (median= 4 days). The hospital charges totaled \$4,052,122 and AHCCCS/Medicaid was the expected payer for the majority of these hospitalizations (81 percent, n=33). Of the cases for which AHCCCS/Medicaid was the expected payer, the average cost per hospitalization was \$106,173 (median=\$52,220). There were ten emergency department visits for abusive head injuries. According to Child Fatality Review, there were eight confirmed deaths due to shaken infant syndrome in 2013, and six cases of abusive head trauma where shaking could not be confirmed.

The non-fatal hospitalizations due to abusive head injuries were reported from ten facilities during 2006-2013. Table 1 shows non-fatal hospitalizations due to abusive head injury by facility.

| <b>Table 1. Non-Fatal Hospitalizations due to Abusive Head Injury by Facility, Arizona, 2006-2013</b> |                |     |                |     |                |     |                |     |                |     |                |     |                 |     |                 |     |
|---|----------------|-----|----------------|-----|----------------|-----|----------------|-----|----------------|-----|----------------|-----|-----------------|-----|-----------------|-----|
| Facility  | 2006<br>(n=22) |     | 2007<br>(n=22) |     | 2008<br>(n=42) |     | 2009<br>(n=62) |     | 2010<br>(n=29) |     | 2011<br>(n=44) |     | 2012*<br>(n=28) |     | 2013*<br>(n=41) |     |
|   | n              | %   | n              | %   | n              | %   | n              | %   | n              | %   | n              | %   | n               | %   | n               | %   |
| Banner Desert Medical Center  | 1              | 4%  | -              | -   | 4              | 10% | 9              | 15% | 3              | 10% | 2              | 5%  | *               | *   | 8               | 20% |
| Maricopa Medical Center   | 3              | 14% | 4              | 18% | 5              | 12% | 2              | 3%  | 3              | 10% | 1              | 2%  | *               | *   | *               | *   |
| Phoenix Children's Hospital   | 10             | 45% | 8              | 36% | 18             | 43% | 25             | 40% | 16             | 55% | 30             | 68% | 18              | 64% | 24              | 56% |
| St. Joseph's Hospital and Medical Center  | 4              | 18% | 3              | 14% | 10             | 24% | 8              | 13% | 3              | 10% | 3              | 7%  | *               | *   | -               | -   |
| Tucson Medical Center   | -              | -   | 2              | 9%  | -              | -   | 5              | 8%  | -              | -   | -              | -   | -               | -   | -               | -   |
| University Medical Center   | 3              | 14% | 3              | 14% | 5              | 12% | 9              | 15% | 4              | 14% | 7              | 16% | *               | *   | 6               | 15% |
| Flagstaff Medical Center  | -              | -   | -              | -   | -              | -   | 2              | 3%  | -              | -   | 1              | 2%  | *               | *   | *               | *   |
| Banner Good Samaritan Medical Center  | 1              | 4%  | -              | -   | -              | -   | -              | -   | -              | -   | -              | -   | -               | -   | -               | -   |
| Los Niños Hospital  | -              | -   | 2              | 9%  | -              | -   | 1              | 2%  | -              | -   | -              | -   | -               | -   | -               | -   |
| Scottsdale Healthcare Shea  | -              | -   | -              | -   | -              | -   | 1              | 2%  | -              | -   | -              | -   | -               | -   | -               | -   |

\*Counts <6 have been suppressed

During 2006-2013, the majority of children hospitalized for abusive head injuries resided in Maricopa County. Table 2 shows non-fatal hospitalizations due to abusive head injuries by county of residence.

| County of Residence | 2006 (n=22) |     | 2007 (n=22) |     | 2008 (n=42) |     | 2009 (n=62) |     | 2010 (n=29) |     | 2011 (n=44) |     | 2012* (n=28) |     | 2013* (n=41) |     |
|---------------------|-------------|-----|-------------|-----|-------------|-----|-------------|-----|-------------|-----|-------------|-----|--------------|-----|--------------|-----|
|                     | n           | %   | n           | %   | n           | %   | n           | %   | n           | %   | n           | %   | n            | %   | n            | %   |
| Apache              | 1           | 4%  | 1           | 5%  | -           | -   | -           | -   | -           | -   | -           | -   | -            | -   | -            | -   |
| Cochise             | -           | -   | -           | -   | -           | -   | -           | -   | 1           | 3%  | -           | -   | *            | *   | -            | -   |
| Coconino            | -           | -   | -           | -   | 3           | 7%  | 2           | 3%  | -           | -   | 1           | 2%  | *            | *   | *            | *   |
| Gila                | 1           | 4%  | -           | -   | 1           | 2%  | -           | -   | -           | -   | -           | -   | -            | -   | *            | *   |
| Graham              | -           | -   | 1           | 5%  | -           | -   | 1           | 2%  | -           | -   | 1           | 2%  | *            | *   | -            | -   |
| La Paz              | -           | -   | -           | -   | -           | -   | -           | -   | -           | -   | 2           | 5%  | -            | -   | -            | -   |
| Maricopa            | 14          | 64% | 16          | 73% | 28          | 67% | 30          | 48% | 20          | 69% | 22          | 50% | 10           | 36% | 24           | 56% |
| Mohave              | -           | -   | -           | -   | -           | -   | 2           | 3%  | -           | -   | 1           | 2%  | -            | -   | *            | *   |
| Navajo              | -           | -   | -           | -   | 1           | 2%  | 1           | 2%  | 2           | 7%  | 1           | 2%  | *            | *   | *            | *   |
| Pima                | 3           | 14% | 4           | 18% | 5           | 12% | 12          | 19% | 2           | 7%  | 9           | 20% | *            | *   | 6            | 15% |
| Pinal               | 2           | 9%  | -           | -   | 2           | 5%  | 6           | 10% | 2           | 7%  | 3           | 7%  | 6            | 21% | *            | *   |
| Santa Cruz          | -           | -   | -           | -   | -           | -   | 2           | 3%  | 1           | 3%  | -           | -   | -            | -   | -            | -   |
| Yavapai             | 1           | 4%  | -           | -   | 1           | 2%  | 4           | 6%  | 1           | 3%  | 1           | 2%  | *            | *   | *            | *   |
| Yuma                | -           | -   | -           | -   | -           | -   | 2           | 3%  | -           | -   | 2           | 5%  | *            | *   | -            | -   |
| Non-Arizona County  | -           | -   | -           | -   | 1           | 2%  | -           | -   | -           | -   | 1           | 2%  | -            | -   | *            | *   |

\*Counts <6 have been suppressed

The sharp increase in abusive head trauma between 2008 and 2009 may have been the result of administrative changes in reporting hospital discharge data. Cases that may not have been previously reported as intentionally inflicted injuries are now reported by each hospital at which a child is seen. This change increases the likelihood that a case of abusive head trauma will be reported and captured in the hospital discharge data; it also increased the likelihood that the same child may be reported by more than one hospital if they are seen at different facilities. Figure 1 compares the number of abusive head trauma-related fatalities to inpatient hospitalizations and emergency department visits by year for 2006-2013.

**Figure 1. Cases of Abusive Head Trauma by Year, Arizona, 2006-2013**

