

Mapping Pediatric Tetanus Cases in Central Pennsylvania and Analyzing Hospital Costs Associated with Treatment

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Background

Under-immunization is common among children from Amish and Mennonite communities in Pennsylvania. This results in cases of vaccine preventable diseases (VPDs) sporadically. Nearly 20% of nationally reported pediatric tetanus cases in the past 10 years were treated at our institution. We characterize demographics and costs of treating this rare, but largely preventable infection.

Methods

- Chart review based on ICD-9 codes for tetanus in patients aged 0-17 years between January 2006 and December 2015.
- Cost data were extracted from Horizon Business Insight software and analyzed in Microsoft Excel.
 - Cases were classified based on all patient refined diagnosis-related groups (APR-DRGs). APR-DRG's include a further detailed DRG breakdown for non-medicare patients, including newborns and children and also measure severity of illness and risk of mortality.
 - This is an indication of resource intensiveness with higher APR-DRG weights being more resource intensive.
 - Hospital (total) costs were divided into fixed (salaries, equipment, buildings) and variable costs (medications and supplies to provide care).
- Cases were mapped using UDS Mapper.

Table 1: Demographics and Characteristics of pediatric tetanus cases treated at Penn State Children's Hospital (PSCH)

CASE	AGE (YR)	SEX	IMMUNIZED	AMISH	EXPOSURE	INCUBATION PERIOD, DAYS	PRESENTING SYMPTOMS	LENGTH OF STAY, DAYS	OUTCOME	COUNTY
1	7	M	No	Yes	Hand laceration	5	Jaw pain; trismus; sore tongue; neck, back and leg stiffness	10	Discharged home with NJ feeds	Lancaster
2	11	M	No	Yes	Knee laceration	7	Trismus; pain and discharge from knee wound	22	Discharged home with NJ feeds	Lancaster
3	9	F	No	Yes	Foot Splinter	6	Trismus; dysphagia	7	Discharged home with NJ feeds	Lancaster
4	7	F	No	No	Foot laceration	11	Trismus; body stiffness; sore throat	17	Discharged home	Lebanon
MEDIAN	8					6.5		13.5		

Results

- Four cases of pediatric tetanus between Jan 2006- Dec 2015 were identified ; representing 18% of nationally reported pediatric tetanus cases during this time period
- 100% cases occurred in unimmunized patients
- 3 of 4 (75%) cases occurred in Amish individuals.
- Net loss of \$40,506 to the hospital occurred over the course of 10 years
- Each case treated resulted in a median loss of \$4,043 to the hospital.
- Self-paying Amish and Mennonite patients covered 96% of the total cost to the hospital while the insured patient paid 21%

Conclusions

- Tetanus cases cause a preventable cost to both hospitals and self-insured Amish and Mennonite patients.
- Localities with high concentrations of Amish and Mennonite populations should be studied to determine attitudes towards and knowledge surrounding vaccination
- Costs of treatment should be emphasized in preventative community level outreach efforts.

References

1. National Notifiable Diseases Surveillance System, 1990-2015
2. Adams CE, Leverland MB. The effects of religious beliefs on the health care practices of the Amish. Nurse Pract 1986;11:58, 63, 7.

Table 2: Costs associated with pediatric tetanus treatment. Numbers in red are negative.

Case	Insurance	APR-DRG Weight	Charges	Total Cost	Fixed Costs	Variable Costs	Expected Payment	Projected Profit
1	Self-pay	0.55	\$21,671	\$13,833	\$7,343	\$6,490	\$13,948	\$115
2	Self-pay	1.3	\$70,468	\$40,163	\$20,323	\$19,840	\$45,353	\$5,190
3	Self-pay	0.54	\$29,777	\$19,417	\$12,926	\$6,492	\$11,217	(\$8,200)
4	Private insurance	0.71	\$92,872	\$47,757	\$30,226	\$17,531	\$10,146	(\$37,611)
Total			214,788	\$121,170	\$70,818	\$50,353	\$80,664	(\$40,506)
MEDIAN		0.63	\$50,123	\$29,790	\$16,625	\$12,011	\$12,583	(\$4,043)

Figure 1: Geographical distribution of incident cases in relation to PSCH.

