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ORIGINAL PAPER

All-Terrain Vehicle Injury Prevention: Healthcare Providers' Knowledge, Attitudes, and the Anticipatory Guidance They Provide

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Abstract All-terrain vehicles (ATVs) continue to be an increasing cause of injuries and deaths in children, especially in rural communities. More children die in the United States each year from ATV-related events than from bicycle crashes. The purpose of this study was to determine the ATV anticipatory guidance practices of primary care providers, as well as their attitudes, knowledge, and the barriers faced in educating families about the risk of ATV use. An electronic survey was administered to primary care providers belonging to state medical societies. More than 60% of respondents (Total N = 218) believed that ATV anticipatory guidance was important to provide to pediatric patients and their families. However, 78% stated they provide ATV safety counseling less than 10% of the time during regular pediatric exams, and only 12% stated they do so greater than 25% of the time. Families rarely ask providers for advice on ATV safety issues; 84% of providers were asked once a year or less. ATV knowledge scores were low (median score 2 of 12); however, those with previous ATV exposure had significantly higher scores. Many respondents affirmed insufficient knowledge (47%) and inadequate resources (63%), but the most commonly identified barrier was that it was not a routine part of their practice. Providers in the study demonstrated limited knowledge, reported multiple barriers, and provided little or no ATV safety counseling. However, they consider ATV anticipatory guidance important for their patients. Armed with increased knowledge and appropriate resources, providers could play a significant role in promoting ATV safety.

Keywords Injury prevention · All-terrain vehicles · Primary health care · Anticipatory guidance · Safety · Counseling

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Introduction

All-terrain vehicle (ATV) use is a significant and increasing cause of injuries and deaths. In the US alone, there were 833 ATV-related deaths in 2006, more than three times the number of deaths in 1998 [1]. Children under 16 years of age have comprised just over one-quarter of all ATV-related fatalities, with 43% of child victims under the age of 12 [1]. In fact, more children die from ATV crashes than from riding bicycles [2].

Based on National Electronic Injury Surveillance System data, there are about 150,000 ATV-related emergency department visits each year. Roughly 1 in 3 of these visits are by children under 16, and well over half of patients are under 24 years of age [1, 3, 4].

The injuries and deaths caused by ATVs is primarily a problem of rural communities, large suburban acreages, and off-road vehicle recreational areas. Farm families are particularly vulnerable due to a high rate of ATV exposure. In 2000, a survey of 645 students participating in agricultural education programs in Arkansas revealed that 74% of farm youth had ridden an ATV in the previous month compared to 41% of their rural non-farm peers [5].

Although most ATVs are designed for adults, children are often allowed to drive them, frequently with unsafe behaviors (e.g., no helmet, riding with passengers) [6]. A national case–control study found that the adjusted risk of injury on an ATV is 12 times higher for children than for older adult drivers [7].

Anticipatory guidance is a mainstay of medical visits, especially well-child and routine adolescent exams. The focus of such counseling has shifted from infectious diseases towards injury prevention as injury has become the primary threat to children's health. As the cost of injuries has dramatically risen over the past several decades, prevention has become an increasingly cost effective use of a clinician's time.

There is growing evidence that counseling-based interventions for children's health and development are associated with improved functional outcomes [8]. Among these, injury prevention counseling is supported by the best evidence [9, 10], including interventions to increase use of motor vehicle restraints [11] and wearing bicycle helmets [12, 13]. Medical organizations, including the American Academy of Pediatrics and the American Academy of Family Physicians, recognize the integral role of anticipatory guidance in preventing injuries in children and teens and promote safety counseling in their preventative healthcare guidelines.

To our knowledge, no studies have reported on family physician and mid-level provider anticipatory guidance for ATV injury prevention. To address this issue among our state's primary healthcare providers, we measured their attitudes toward ATV injury prevention counseling in the office, the amount of ATV safety anticipatory guidance they presently provide, their knowledge of ATV safety and laws, and the barriers they identified to providing more guidance to children and their families.

Methods

Survey Development and Dissemination

An electronic survey was developed using WebSurveyor. To establish content validity, the survey was pilot tested and reviewed by fourteen healthcare providers and experts in injury prevention. After study approval by our Institutional Review Board, a convenience sampling of primary healthcare providers was obtained by electronically distributing the survey through state medical professional societies. Two follow-up invitations were sent one month apart, with the exception of the state chapter of the American Academy of Family Physicians (AAFP) which sent a single follow-up mailing.

Only those family physicians, nurse practitioners, physician assistants, and pediatricians providing primary care to children, teens and their families were eligible and invited to complete the survey. Participation was voluntary and survey results were anonymous. As an incentive to participate, subjects could enter a drawing for several raffle items. The raffle site was separate from the survey and could not be linked to the data provided, thus maintaining the anonymity of the subject's responses.

Survey Content

The survey was composed of 29 questions divided into four parts: Part A, demographics and previous ATV exposure (7 questions); Part B, current ATV safety-related anticipatory guidance attitudes and practices (7 questions); Part C, a needs assessment for developing future anticipatory guidance practice and injury prevention resources (3 questions); and Part D, ATV safety and state law knowledge (12 questions).

Data Analysis

Frequency and descriptive analyses were completed for each item. For questions scored using a five-point Likert scale, we grouped those who disagreed with those who somewhat disagreed and those who agreed with those who somewhat agreed. Comparisons of proportions were done using the Chi-square test or the Fisher's Exact test (Vassar website, http://faculty.vassar.edu/lowry/VassarStats.html). Other statistical analyses were done using Prism graphing and statistical analysis software (GraphPad Prism 4.0) or Statistical Analysis Software (SAS, v9.2).

An ATV knowledge score was computed from the subject's answers to 12 questions (Part D) with 1 point for each correct answer. Knowledge scores were examined using measures of central tendency (mean, median, standard deviation, confidence interval) and compared across demographic variables of interest. Knowledge scores were also compared with the respondent's response to how adequate they felt their knowledge to be and how much anticipatory guidance they provided. Because scores were not normally distributed, comparisons of two groups were performed using the non-parametric Mann–Whitney test. Comparisons of three or more groups were done using the non-parametric Kruskal–Wallis test with Dunn's multiple comparison post-test. In all cases, significance was defined as $P < 0.05$.

Results

Demographics of Survey Participants

There were 218 eligible healthcare providers who completed the survey. Table 1 summarizes the demographics of

Table 1 Demographic characteristics of sample population (statewide) versus study participants

	Family medicine		Pediatricians		Physician assistants		Nurse practitioners	
	Statewide	Study	Statewide	Study	Statewide	Study	Statewide	Study
Male (%)	66	66	48	39	30	29	4	11
Female (%)	34	34	52	61	70	71	96	90
Caucasian (%)	86	93*	NA	96	99	100	NA	95
Age (mean)	47	47	44	46	43	46	49	47

Physician certification			ATV user status of survey participants		
Certification (N = 150)	N	Percent	ATV user status (N = 218)	N	Percent
Family medicine	102	68	No exposure	104	47
Pediatrics	35	25	Ridden on, don't own	86	40
Other/none	13	7	Own	29	13

* Significantly different from the Iowa population at the $P < 0.05$ level

NA not available

survey respondents and compares them to those statewide. The only statistically significant difference observed was that family medicine respondents included a higher percentage of Caucasians (93%) than that statewide (86%). There were approximately equal numbers of males and females who participated in the study, and the majority of respondents were MDs and/or providers board certified in Family Medicine. The median age was 48 and ranged from 26 to over 70. Over half of respondents indicated having operated or ridden an ATV in the past and 13% reporting current ATV ownership. There were no differences in ATV use by gender, age, or type of licensure.

Practices Related to Anticipatory Guidance for ATV Safety

Respondents were asked how often they inquired whether families used or owned an ATV. Seventy-eight percent stated they do so less than 10% of the time, and only 12% stated they do so more than 25% of the time. Similarly, 84% indicated that families ask them about ATV safety once a year or less, with more than half responding that they have never been asked. Male providers were more likely than female providers to report being asked by families about ATVs (60% vs. 40%, $P < 0.05$), and current owners of ATVs were more likely to ask families greater than half of the time about ATV use when compared to non-owners (50% vs. 31%, $P < 0.05$).

Only 19% of respondents reported providing ATV safety counseling for 10% or more of their families. The most common types of counseling were verbal communication (28%) and distribution of pamphlets/handouts (5%). Two-thirds of providers responded "None" with regards to types of education and resources being used. Table 2 summarizes results related to current practices.

Attitudes Related to ATV Safety Anticipatory Guidance

Thirty-one percent of providers agreed with the statement that they had adequate knowledge to provide ATV safety anticipatory guidance. Even fewer (15%) felt that they had adequate resources. The proportion of subjects with ATV experience who reported adequate knowledge was greater than those with no ATV experience (39% vs. 20%, $P < 0.001$), and respondents who currently owned an ATV were more likely to report having adequate anticipatory guidance resources relative to other respondents (34% vs. 11%, $P < 0.05$) (Table 3).

More than 60% agreed that ATV injury prevention anticipatory guidance was important for their patients and families. Attitudes related to anticipatory guidance did not differ based on gender, age, or licensure.

Knowledge of ATV Safety and State Laws

The survey had 12 knowledge items including five multiple choice and seven true/false questions (Table 4). The median knowledge score was 2 (95% CI 2.7, 3.5). The questions answered correctly most often were related to how many people a traditional ATV is designed to carry ("one," 67%) and whether state law requires adults to wear a helmet ("false," 48%). All other questions were answered correctly by fewer than 30% of survey participants. Only 11% were knowledgeable about vehicle size recommendations for their pediatric patients.

Table 2 Current anticipatory guidance practices for ATV safety

Percentage of time	N	Percent
I ask my pediatric patients and/or their families if they own or use an ATV the following percentage of time		
<10%	170	78
10–25%	21	9.6
26–50%	10	4.6
51–75%	6	2.8
76–90%	7	3.2
>90%	4	1.8
Number of times	**N**	**Percent**
Patients or their families ask me about ATV safety issues on average about the following number of times		
Never	116	54.1
Once per year or less	66	30.0
2–5 times per year	30	14.0
5–10 times per year	3	1.4
10 times per year or more	1	0.5
Percentage of time	**N**	**Percent**
I provide ATV injury prevention anticipatory guidance to my pediatric patients and/or their families the following percentage of time		
<10%	177	81.2
10–25%	16	7.3
26–50%	6	2.8
51–75%	8	3.7
76–90%	5	2.3
>90%	6	2.8

N = 218

Respondents who had operated or ridden on an ATV, but did not currently own one (median 3.0, 95% CI 3.0, 4.1), scored higher than those who had never been on an ATV (median 1.0, 95% CI 1.5, 2.4). Subjects who currently owned an ATV had the highest knowledge scores (median 6.0, 95% CI 5.2, 7.3). Males (median 3.0, 95% CI 3.0, 4.1) scored higher than females (median 2.0, 95% CI 2.1, 3.1), $P < 0.05$; but there were no differences in scores based on licensure or age.

Non-owners who had higher knowledge scores were more likely to provide ATV safety anticipatory guidance to patients and their families than those providers with lower scores ($P < 0.01$). In contrast, for ATV owners, there was no association between increased anticipatory guidance and higher knowledge scores.

Barriers to Providing ATV Safety Anticipatory Guidance

Almost half of the respondents affirmed that ATV anticipatory guidance "is not a routine part of my well checks/physical exams." The next most common barrier was "I do not have enough time" (40%). Lack of specific ATV safety knowledge and lack of necessary ATV injury prevention resources were both listed as barriers to giving anticipatory guidance by two in five providers (Table 5). Whereas 7% of respondents indicated there were no barriers, 53, 26, and 11% of respondents indicated 1–2, 3–4, and 5–6 barriers, respectively.

Relative to other providers, MDs were less likely to indicate they had insufficient resources (25% vs. ≥50%, $P < 0.001$), but more likely to cite lack of time as a barrier (48% vs. ≤37%, $P < 0.05$) (Table 6). Respondents who had ridden on or owned an ATV were less likely to cite lack of ATV knowledge (≤33% vs. 48%, $P < 0.05$) and lack of familiarity with ATVs (<3.5% vs. 27%, $P < 0.001$) as barriers.

Practitioners who provided anticipatory guidance to <10% of their patients were significantly more likely to report more barriers than those who provided injury counseling to ≥10% ($P < 0.01$). All respondents who listed 4 or more barriers provided anticipatory guidance to <10% of patients and their families. However, a relationship between the listing of barriers and the stated importance of ATV safety anticipatory guidance was not found.

Resources Needed for Anticipatory Guidance

Respondents valued pamphlets or handouts on ATV safety and laws (77%) and educational website information (53%) as the resources potentially most useful in providing better

Table 3 Attitudes related to ATV knowledge and anticipatory guidance

Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree
I have adequate *knowledge* to provide ATV injury prevention anticipatory guidance to my pediatric patients and their families (N = 216)				
45 (21%)	56 (26%)	49 (23%)	47 (22%)	19 (9%)
I have adequate *resources* to provide ATV injury prevention anticipatory guidance to my pediatric patients and their families (N = 214)				
69 (32%)	68 (32%)	46 (21%)	23 (11%)	8 (4%)
ATV injury prevention anticipatory guidance is *important to provide* to my pediatric patients and their families (N = 214)				
11 (5%)	12 (6%)	58 (27%)	62 (29%)	71 (33%)

N values and percentages are for respondents who answered the question

Table 4 Survey knowledge questions and answers

	% Respondents with correct answer
1. A traditional ATV is designed to carry how many people? *Answer: one*	68
2. According to manufacturer guidelines, what is the largest ATV engine size recommended for use by children 6–11 years of age? *Answer: under 70 cc*	15
3. According to manufacturer guidelines, what is the largest ATV engine size recommended for use by children 12–15 years of age? *Answer: 90 cc*	11
4. According to Iowa law, when is it legal to operate a traditional ATV with 1 or more passengers? *Answer: never*	22
5. According to Iowa law, children 12–17 years of age may operate an ATV on public land. *Answer: if they have a valid safety certificate*	15
6. According to Iowa law, under which circumstances can a private citizen operate an ATV on public roads? *Answer: for agricultural purposes*	14
7. At what age are ATV operators subject to prosecution for violation of Iowa ATV laws? *Answer: at any age*	27
8. Children are required by Iowa law to wear an approved helmet while operating an ATV. *Answer: false*	22
9. Adults are required by Iowa law to wear an approved helmet while operating an ATV. *Answer: false*	48
10. According to Iowa law, children 12–17 years of age must have a valid safety certificate to operate an ATV on private land. *Answer: false*	27
11. According to Iowa law, children 12–17 years of age must be supervised by an adult to operate an ATV on private land. *Answer: false*	22
12. According to Iowa law, failure to report an ATV accident resulting in injury or death to the proper authorities is a misdemeanor. *Answer: true*	27

ATV anticipatory guidance. Information on local ATV safety courses and ATV safety posters were both endorsed by over one-third of participants as well. Eleven percent reported no need for additional resources. Healthcare providers requested information to increase their own knowledge in the form of educational websites (31%) and pamphlets/handouts (26%). Almost one in five providers (18%) thought a continuing medical education (CME) course on ATV safety and laws would be beneficial.

Table 5 Perceived barriers to providing anticipatory guidance for ATV injury prevention

Barrier	N	%
It is not a routine part of my well checks/physical exams	107	49
I do not have enough time	88	40
I lack specific knowledge concerning ATV safety	81	37
I am unaware of my patients' use of ATVs	80	37
I do not have the necessary ATV injury prevention resources	80	37
I am not familiar with the use of ATVs	31	14
Other	18	9
I do not believe any barriers exist	15	7

Participants could provide more than one response

Discussion

Education of parents and children regarding the dangers of ATVs and how to operate them safely is an extremely important component in decreasing ATV-related injuries and deaths [4, 14, 15]. Some authors have written that this should be the main emphasis of ATV injury prevention efforts [16].

Primary care providers are in a unique position to offer ATV injury prevention advice to patients and their families and to direct them to ATV safety resources. Not only do primary healthcare providers have ongoing access to children and their parents, but parents hold the opinion of their providers in high regard and look to them to provide guidance on injury prevention [17, 18, 19].

The majority of health care providers in this study agreed that ATV anticipatory guidance is important for their pediatric patients and families. However, very few performed routine ATV safety counseling. Respondents in our study most commonly endorsed the barriers that ATV guidance was not part of their routine and that they didn't have enough time. Such barriers may be overcome. The more importance providers assign to addressing safety hazards with families, the less likely they are to perceive barriers [20–23].

Very few providers in the study reported routinely asking whether patients and their families own or use an ATV. A key factor in injury prevention is identifying patients who may be at risk. Checklists completed by families prior to health maintenance visits are an excellent time-saving method to assess risk and provides a basis for anticipatory guidance tailored to the needs of the patient. One study of family physicians found that those who used

Table 6 Relationships between perceived barriers and demographics, ATV experience, and guidance practices

Provider type	Lack of time	Lack of resources
Medical doctor (N = 122)	59 (48%)	30 (25%)
Doctor of osteopathy (N = 28)	10 (36%)	14 (50%)
Physician assistant (N = 49)	12 (25%)	26 (53%)
Nurse practitioner (N = 19)	7 (37%)	10 (53%)
ATV user status	**Lack of knowledge**	**Lack of familiarity**
Never operated or ridden (N = 103)	49 (48%)	28 (27%)
Op/ridden, don't own (N = 86)	28 (33%)	3 (3.5%)
Currently own (N = 29)	4 (14%)	0 (0%)
Number of barriers	**<10% of time**	**>10% of time**
0 Barriers	9 (53%)	8 (47%)
1 Barrier	55 (77%)	16 (23%)
2 Barriers	37 (76%)	12 (24%)
3 Barriers	26 (84%)	5 (16%)
4 Barriers	26 (100%)	0 (0%)
5 Barriers	12 (100%)	0 (0%)
6 Barriers	10 (100%)	0 (0%)

well visit forms or other prompts provided better anticipatory guidance [24]. Primary care providers serving children from rural communities should be particularly cognizant of potential ATV exposure and injury risk.

Study participants indicated that patients and their families rarely asked them about ATV safety issues, 80% stating that they were asked once or less each year. This may reflect a family's lack of awareness of the dangers of ATV use and/or their failure to see healthcare providers as experts in ATV safety. The latter may be justified considering the low knowledge scores found in our study. Lack of knowledge has been found in previous studies to correlate with the provision of less injury prevention counseling [22, 23]. The majority of study participants felt that they did not have adequate knowledge to provide ATV anticipatory guidance, and 2 in 5 reported that this was a barrier for them.

Non-ATV owners with higher knowledge scores gave significantly more anticipatory guidance than those with lower scores. Interestingly, ATV owners in our study, despite increased knowledge scores, did not perform more ATV injury prevention counseling. Studies regarding providers' attitudes on other safety issues have shown similar findings; gun-owners were less likely to discuss firearm safety [25] or recommend removal of guns in homes with children [25, 26], and those who used baby walkers with their own children had more negative attitudes towards recommending parents avoid walker use [21, 27].

Medical residents and primary care providers who will serve rural families need ATV injury prevention training. Inadequate training has been identified as a major barrier to injury prevention [28–30]. This training can boost a provider's confidence and promote effective counseling behaviors [31, 32].

Lack of resources was another barrier identified in our survey and in other studies related to injury prevention anticipatory guidance [21, 24, 27, 31]. Providers and patients would both benefit from pamphlets/handouts and educational websites targeting specific groups.

Anticipatory guidance recommendations for regular health visits are extensive. Given the time constraints of typical well-child visits, providers often choose which topics they cover and which they will forego. One study found that child experts determined the relative importance of injury prevention topics based on the severity and frequency of injury, the availability of environmental strategies to prevent the injury, and the perceived effectiveness of these strategies [33]. ATV injury prevention should be highly considered for guidance as it meets these criteria well, especially for providers serving patients from rural communities.

Websites presently available with information about ATV safety include: http://www.atvsafety.gov/, http://www.atvsafety.org/, and http://www.cpsc.gov/nsn/atv.html. ATV safety recommendations from the American Academy of Orthopaedic Surgeons are in Table 7 [34].

Limitations

Our study has a number of limitations. Results were from a single state and the survey's convenience sampling impacts

Table 7 American Academy of Orthopaedic Surgeons recommendations for ATV safety [34]

ATV operators should be licensed on the basis of demonstrated competence in handling the vehicle and knowledge of the safety hazards.
ATVs should never be driven by children <12 years of age.
ATVs > 90 cc in size should never be operated by persons < 16 years of age.
Operators should be required to wear safety equipment, including helmets.
ATVs should be used only during daylight hours.
Only one person at a time should ride an ATV that is intended for single person use.
An ATV should not be operated while the driver is under the influence of drugs or alcohol.

the generalizability of our results. Providers who are not members of professional societies were not included in the study. However, the demographics of study participants were similar to those of providers statewide suggesting that our sample population and study results may be representative of our predominately rural state.

Our study was subject to potential sampling bias. Survey respondents may have been more likely to have a particular interest in ATVs and/or injury prevention. If so, then we would speculate that knowledge scores and rates of anticipatory guidance by study participants might actually be higher than those of non-participants.

Data obtained by self-report may be subject to social desirability bias. However, this bias should create an over reporting of safety counseling, and the study found a low rate of anticipatory guidance practice.

Conclusions

Providers in the study reported low rates of ATV anticipatory guidance and lacked ATV safety knowledge, but believed ATV injury prevention counseling was important. Educating providers and increasing their practice of routine ATV safety counseling could prevent injuries, reduce medical costs, and save lives. Although a variety of prevention strategies will be necessary to fully address the problem, ATV safety anticipatory guidance by healthcare providers is an important factor in changing behavior and increasing awareness of ATV safety.

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