

A Prospective & Qualitative Prehospital Comparison of Head Immobilization Devices.¹

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Introduction

The immobilization of patients with a potential cervical spine injury is a basic skill taught to prehospital providers. Methods for immobilizing such patients lack standardization in terms of technique and equipment. This study prospectively evaluated trained, experienced prehospital providers' opinions on the immobilization qualities of an adjustable, rigid-head immobilization device that integrates disposability as a cleaning method.

Methods

Provider perceptions of ease of use, ease of cleaning and immobilization characteristics were evaluated with a 5-point Likert Scale. A 14-item questionnaire was distributed at the beginning of the study period to compare SpeedBlocks with the device they have used in the past. Participants were trained in the proper application of the SpeedBlocks device. A 12-item questionnaire was completed each time an individual user applied cervical immobilization during the course of the study period. A paired t-test was performed to compare the provider opinions. Statistical significance was set at $p \leq 0.05$.

Results

The questionnaire was structured to reflect opinions regarding the following categories: perceived usefulness in good weather and bad, speed of application, how securely the head was immobilized, ease of storage in the ambulance, how easily the device could be readjusted, how easily the patient's head and neck could be visualized after application, how easily the device could be cleaned, and how confident the participant was in that cleaning. Participants rated the Speedblocks device as superior to reusable foam blocks in all categories except ease of storage ($p = 0.056$). This result was interpreted as equivalent to reusable foam blocks. Particularly strong responses were measured in the categories of usefulness in good weather, speed of application, how securely the head was immobilized, how easily the device could be readjusted, how easily the patient's head and neck could be visualized after application, and confidence in cleaning.

Conclusion

These results indicate a preference for a new device, SpeedBlocks, over traditional reusable foam blocks, specifically in several areas. These data should be used by emergency medical services to support evidence-based medical treatment decisions and by manufacturers to develop more usable, efficacious products.

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Abstract

The immobilization of patients with a potential cervical spine injury is a basic skill taught to prehospital providers at the EMT-Basic Intermediate and Paramedic levels.^{1,2} Methods for immobilizing such patients lack standardization in terms of technique and equipment.³ Commonly, EMS services use sandbags, blanket rolls or towels for cervical and head immobilization. Many services are unwilling to change devices without scientific evidence. A favored method of immobilization utilizes reusable foam blocks which attach to a six-foot spine board with Velcro[®] attachments. These reusable foam immobilizers may be limited in their ability to allow visualization of the patient's head and neck after application and are not easily cleaned due to Velcro straps and surfaces which trap blood and other biocontaminants. A device named SpeedBlocks[®] (2001, Laerdal Medical AS, Stavanger, NO) claims superior performance in these areas. However, there are no data currently available to support these claims.

This study prospectively evaluated trained, experienced prehospital providers' opinions on the immobilization qualities of an adjustable, rigid head immobilization device that integrates disposability as a cleaning method. This is thought to be an improvement over the industry standard of semi-rigid, reusable foam immobilization blocks. Both devices are currently used by prehospital providers in this study.

Methods

This study was conducted by the University of Pittsburgh Department of Emergency Medicine, the School of Health and Rehabilitation Science and the Center for Emergency Medicine of Western Pennsylvania. Exempt approval was granted by the University of Pittsburgh Institutional Review Board.

Provider perceptions of ease of use, ease of cleaning and immobilization characteristics were evaluated with a 5-point Likert Scale.

A 14-item questionnaire (Appendix 1) was developed and designed to be distributed at the beginning of the study period for subjects to complete and compare SpeedBlocks with the device they have used in the past. Participants were trained in the proper application of the SpeedBlocks device using a seven minute training video provided by the manufacturer. Working in groups of two, they were then given the opportunity to immobilize each other first using reusable foam blocks, then using SpeedBlocks. At the end of this practice period they were asked to complete the 14 item questionnaire. Familiarity with the foam block device was assumed since it was the only device in use prior to switching to SpeedBlocks.

A 12-item questionnaire (Appendix 2) was developed and completed each time an individual user applied cervical immobilization during the course of the study period regardless of which immobilization device was used.

Study participants were experienced EMTs and paramedics employed by participating services. Further demographic information was not obtained.

A mailing was conducted to addresses of EMS Services in the Pennsylvania, Ohio and West Virginia who had purchased the SpeedBlocks device. This listing was supplied by Laerdal Medical Corporation. The mailing consisted of an invitation to participate in this study.

Initial questionnaires were completed and returned to the Principle Investigator. Usage questionnaires were completed each time a patient was immobilized and were collected every two weeks from study sites.

Final statistics were compiled using SPSS version 11.0 (SPSS Inc. Chicago, IL.) Statistical significance was set at $p \leq 0.05$. A standard paired t-test was performed to compare the opinions in connection with the two devices.

Results

Fifteen addresses of EMS agencies were provided by the manufacturer. The mailing was completed to all fifteen with a request to respond within thirty days to the study coordinator if the service wished to participate in the study. No follow up phone or mail contact was attempted. Responses are listed in Table 1.

The participating service conducted the training session and returned twenty-five initial questionnaires comparing SpeedBlocks to the device they had used in the past.

The questionnaire was structured to reflect opinions regarding the following categories: perceived usefulness in good weather and bad, speed of application, how securely the head was immobilized,

ease of storage in the ambulance, how easily the device could be readjusted, how easily the patient's head and neck could be visualized after application, how easily the device could be cleaned, and how confident the participant was in that cleaning. The results of these initial questionnaires are contained in Table 2.

Participants rated the Speedblocks device as superior to reusable foam blocks in all categories except ease of storage ($p = 0.056$). This result was interpreted as equivalent to reusable foam blocks. Particularly strong responses were measured in the categories of usefulness in good weather, speed of application, how securely the head was immobilized, how easily the device could be readjusted, how easily the patient's head and neck could be visualized after application, and confidence in cleaning.

The participating service also returned 41 actual usage questionnaires over a six week period. Three questionnaires were completed on foam blocks. Thirty-eight questionnaires were completed on

Response	N	%
Respond – Participate	1	6.667
Incorrect Address	1	6.667
Respond – Not using device	2	13.33
No Response	11	73.3

Table 1

Feature	n	SpeedBlocks		Foam Blocks		t	P*
		M	SD	M	SD		
Usefulness in good weather	16	4.50	0.52	3.7	0.45	3.87	.002
Usefulness in bad weather	9	4.3	0.50	3.5	0.53	2.40	.043
Speed of application	23	4.2	0.65	3.3	0.71	4.47	.000
How secure immobilization	23	4.7	0.86	3.0	0.52	7.91	.000
Ease of storage	17	3.5	1.12	3.1	1.0	2.06	.056
Ease of re-adjustment	22	4.4	0.79	3.3	0.77	4.61	.000
Ease of visualization	23	4.9	0.34	2.6	0.77	12.5	.000
Ease of cleaning	14	4.2	0.58	3.1	0.77	3.32	.006
Confidence in cleaning	17	3.5	0.51	2.0	0.75	6.93	.000

Table 2

SpeedBlocks. The three foam block questionnaires were not included in these data since the total number returned might result in an unfair comparison between the two devices. The response results of the SpeedBlocks actual usage questionnaires are reported in Table 3. Participants rated SpeedBlocks in a highly positive manner in all categories.

Specifically, 66.6% of respondents said the device was easy/very easy to apply under good weather conditions, and 12.9% of respondents used the device under bad weather conditions (defined as rain or snow), also rating the device easy/very easy to apply under bad weather conditions. Three questionnaires specifically noted that it was extremely cold.

Feature	n	SpeedBlocks	
		M	SD
Usefulness in good weather	28	4.50	0.64
Usefulness in bad weather	5	4.8	0.45
Speed of application	38	4.45	0.68
How secure immobilization	38	4.81	0.39
Ease of storage	39	4.43	0.79
Ease of re-adjustment	29	4.34	0.72
Ease of replacing pads	19	4.47	0.70
Ease of visualization	39	4.56	0.55
Ease of cleaning	19	4.05	0.97
Confidence in cleaning	20	3.45	0.60

Table 3

Individual responses to questions are reported in Table 4.

Feature	1		2		3		4		5		No response
	n	%	n	%	n	%	n	%	n	%	
Usefulness in good weather					2	5.1	10	25.6	16	41	NA
Usefulness in bad weather							1	2.6	4	10.3	NA
Speed of application			1	2.6	1	2.6	16	41	20	51.3	1
How secure immobilization							7	17.9	31	79.5	1
Ease of storage			1	2.6	4	10.3	11	28.2	23	59	0
Ease of re-adjustment			1	2.6	1	2.6	14	35.9	13	33.3	10
Ease of replacing pads					2	5.1	6	15.4	11	28.2	20
Ease of visualization					1	2.6	15	38.5	23	59	0
Ease of cleaning	1	2.6			2	5.1	10	25.6	6	15.4	20
Confidence in cleaning*			1	2.6	9	23.1	10	25.6			19

*- Note, Likert score for this item rated 1-4, not 1-5

Table 4

All respondents replied that the device was easy/very easy to apply, and 92.3% of respondents said they were able to apply the device quickly or very quickly.

97.4% of respondents felt the device securely immobilized the head (17.9% rated it as securing above average and 79.5% rated it very secure). Respondents were able to store the device as easily as foam blocks.

69.2% of respondents felt it was easy/very easy to adjust the device, and 97.5% of respondents felt it was easy/very easy to visualize the patient's eyes, nose, ears, mouth and neck with the device and collar in place. 43.6% of respondents felt it was easy to replace pads, 41% of respondents felt it was easy to clean the device, and 48.7% of respondents felt confident to very confident that the device was decontaminated after cleaning. All three of these areas were listed as specific advantages by the manufacturer.

Discussion

Immobilization of the head and cervical spine is a basic skill taught to all Emergency Medical Technicians-Basic (EMT-B). It is emphasized and practiced in other certification courses such as Basic Trauma Life Support (BTLT),⁴ PreHospital Trauma Life Support (PHTLS),⁵ and extrication courses. Although some authors suggest that such devices are overused and too many patients are needlessly immobilized, it is still regarded as a standard of care.⁶ This has also led to studies that have assessed the EMT's and Paramedic's ability to reliably screen patients according to a protocol to determine who should or should not be immobilized.⁷

This study was undertaken for two reasons. First, it was done to assess the attitudes and opinions of field personnel regarding a cervical immobilization device. Second, such devices have rarely been studied. Since they are exempt from FDA pre-market approval, they are produced by manufacturers and distributed for use without necessarily undergoing clinical study or having little if any data to support their efficacy. In view of the current trend in emergency medical services towards the use of evidence-based medicine,

the authors felt it important to try and supply some data which would indicate whether or not the device was perceived as useful or had specific advantages over what is currently being used.

As emergency medical services mature as a profession, it is important for those actually providing care to assess new devices and have input into their usefulness. This input can be used by designers and manufacturers to develop better products, products that actually meet end-user and patient needs.

Implementation of cervical spine clearance protocols has been sporadic in emergency medical services, and the reliability of such protocols has been called into question.^{8,9,10} Additionally, even with such protocols in place, many patients are still immobilized with a cervical collar and a head immobilization device. Such a basic, common skill demands that the devices used are evaluated for efficacy and functionality.

Limitations

The usual tendency of Likert Scale responses to cluster around the mean should be considered. Participation of only one respondent in this study limits the experience and opinions to those of one particular service. Further studies which expand the number of respondents beyond one service should be done.

Conclusion

We present a prospective, qualitative survey comparison of head immobilization devices commonly used in emergency medical services. The survey results indicate a preference for a new device, SpeedBlocks, over traditional reusable foam blocks, specifically in the areas of speed of application, how securely the head was immobilized, how easily the device could be readjusted, how easily the patient's head and neck could be visualized after application, and confidence in cleaning. These data should be used by emergency medical services to support evidence-based medical treatment decisions, and by manufacturers to develop more usable, efficacious products.

References

- ¹Stoy, WA, & the Center for Emergency Medicine (1996). Mosby's EMT-Basic Textbook. St. Louis, MO: Mosby-Year Book, Inc.
- ²The American Academy of Orthopaedic Surgeons (1993). Emergency Care and Transportation of the Sick and Injured. Rosemont, IL: The American Academy of Orthopaedic Surgeons.
- ³De Lorenzo RA. A review of spinal immobilization techniques. J Emerg. Med. 1996 Sep-Oct, 14(5):603-13. Review
- ⁴Campbell, J. (2000). Basic Trauma Life Support for Paramedics and Other Advanced Providers (Fourth Edition). Upper Saddle River, NJ: Brady/Prentice Hall Health
- ⁵Pre-Hospital Trauma Life Support Committee of The National Association of Emergency Medical Technicians & The Committee on Trauma of the American College of Surgeons (1994). PHTLS Basic and Advanced Pre-Hospital Trauma Life Support. St. Louis, MO: Mosby-Year Book, Inc.
- ⁶Sahni R, Menegazzi JJ, Mosesso VN Jr. Paramedic evaluation of clinical indicators of cervical spinal injury. Prehosp Emerg Care. 1997 Jan-Mar;1(1):16-8
- ⁷Domeier RM, Swor RA, Evans RW, Hancock JB, Fales W, Krohmer J, Frederiksen SM, Rivera-Rivera EJ, Schork MA. Multicenter prospective validation of prehospital clinical spinal clearance criteria. J Trauma. 2002 Oct;53(4):744-50.
- ⁸Cone CR, Wydro GC, Mininger CM. Current practice in clinical cervical spinal clearance: implication for EMS. Prehosp Emerg Care. 1999 Jan-Mar;3(1):42-6
- ⁹Pennardt AM, Zehner WJ Jr. Paramedic documentation of indicators for cervical spine injury. Prehospital Disaster Med. 1994 Jan-Mar; 9(1):40-3
- ¹⁰Brown LH, Gopugh JE, Simonds WB. Can EMS providers adequately assess trauma patients for cervical spine injury? Prehosp Emerg Care. 1998 Jan-Mar;2(1):33-6

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Question		SpeedBlocks					Previous or Alternate Product				
	What head immobilizer(s) do you currently use? If more than one, please state so and why?						Please write name and model:				
1	How useful is the device in good weather conditions?	1 Very Difficult	2 Difficult	3 Average	4 Useful	5 Very useful	1 Very Difficult	2 Difficult	3 Average	4 Useful	5 Very useful
2	How useful is the device in adverse weather conditions?	1 Very Difficult	2 Difficult	3 Average	4 Useful	5 Very useful	1 Very Difficult	2 Difficult	3 Average	4 Useful	5 Very useful
3	How quickly were you able to apply the device to the patient?	1 Very slow	2 Slow	3 Average	4 Quick	5 Very quick	1 Very slow	2 Slow	3 Average	4 Quick	5 Very quick
4	How securely does the device immobilize the patient?	1 Very insecure	2 Insecure	3 Average	4 Secure	5 Very Secure	1 Very insecure	2 Insecure	3 Average	4 Secure	5 Very Secure
5	How easily could you store the spine board with the base attached in your ambulance?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy
6	If blocks needed re-adjustment, how easily was this performed?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy
7	How easy was it to visualize the eyes, nose, ears, mouth and neck of the patient with device and collar in place?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy
8	Were the replacement foam pads and straps (if applicable) easy to apply to the blocks?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy	N/A				
9	How easy is it to clean the device?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy
10	If the device is cleaned how confident are you that it is decontaminated?	1 Not confident	2 Somewhat Confident	3 Confident	4 Very Confident		1 Not confident	2 Somewhat Confident	3 Confident	4 Very Confident	
11	Would Speedblocks be useful if it were fully integrated (made part of) the six-foot spine board?	<input type="checkbox"/> YES		<input type="checkbox"/> NO							
12	On an average, how many times did you use the replaceable pads before disposing?	1	2-5	6-10	11-15	16+	N/A				
13	Any major likes? Any major dislikes?	Comments:									
14	Would you recommend this head immobilization device to other users? Why?	Comments:									

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	Question					
1.	Please indicate the device that you used:	<input type="checkbox"/> <u>Speedblocks</u> <input type="checkbox"/> <u>Foam blocks</u> <input type="checkbox"/> <u>Other</u>				
2.	Weather ___ Adverse ___ Normal (Adverse = rain or snow) How easily was this device applied in these conditions?	1 Very Difficult	2 Difficult	3 Average	4 Useful	5 Very useful
3.	How quickly were you able to apply the device to the patient?	1 Very slow	2 Slow	3 Average	4 Quick	5 Very quick
4.	How securely did the device immobilize the patient?	1 Very insecure	2 Insecure	3 Average	4 Secure	5 Very Secure
5.	How easily could you store the spine board with the base attached in your ambulance?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy
6.	If blocks needed re-adjustment, how easily was this performed?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy
7.	How easy was it to visualize the eyes, nose, ears, mouth and neck of the patient with device and collar in place?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy
8.	Were the replacement foam pads and straps (if applicable) easy to apply to the blocks?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy
9.	How easy was it to clean the device?	1 Very hard	2 Hard	3 Average	4 Easy	5 Very easy
10.	If the device was cleaned, how confident are you that it is decontaminated?	1 Not confident	2 Somewhat Confident	3 Confident	4 Very Confident	
11.	On an average, how many times did you use the replaceable pads before disposing?	1	2-5	6-10	11-15	16+
12.	Any major likes? Any major dislikes?					