



## **Hand Check Method: Is it an Effective Method to Monitor for Bottoming Out? A National Pressure Ulcer Advisory Position Statement**

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The intention of this position paper is to limit the use of the hand check to static air overlay mattresses. This method of determining bottoming out is inappropriate for replacement mattresses and integrated bed systems (bed frame and support surface).

### **Introduction**

The use of support surfaces is an essential component of comprehensive pressure ulcer prevention and treatment programs. In order to achieve quality outcomes, ongoing monitoring of support surface function is crucial (2014 International Guidelines). A former recommendation for routine bedside monitoring of support surfaces was to implement a 'hand check' to determine that the patient/resident was not "bottoming out" (AHCPR Publication No. 95-0652). The purpose of this position statement is to raise awareness of the issues related to safety and efficacy for the hand check method for bedside monitoring for bottoming out and to recommend the need for further research of alternative methods for monitoring this function. A literature search was conducted using the keywords 'bottoming out', 'hand check', 'immersion', 'support surface' in PubMed, Ovid and Embase and yielded no evidence of published research to validate the 'hand check' as a method of performance evaluation. Therefore, this position paper is based on expert opinion (Strength of Evidence C; 2014 International Pressure Ulcer Guidelines).

### **Background**

A support surface as defined by the National Pressure Ulcer Advisory Panel (NPUAP) Support Surface Standards Initiative (S3I) is "a specialized device for pressure redistribution designed for management of tissue loads, micro-climate, and/or other therapeutic functions (i.e. any mattress, integrated bed system, mattress replacement, mattress overlay, seat cushion, or seat cushion overlay)" (Posthauer ME et al.,2006) (RESNA, 2014).

The *American National Standard for Support Surfaces RESNA SS-1:2014* Volume 1 further defines bottoming out as “the state of support surface deformation at which no increase in mattress/overlay deformation occurs when further loading is applied” (RESNA, 2014). The 2014 International Pressure Ulcer Guidelines define bottoming out as “occurring when a reactive or an active support surface provides insufficient support to adequately distribute pressure due to excessive immersion; the individual presents as sitting or lying on the underlying structure of the bed or chair” (National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance, 2014). That is, the surface is no longer effectively redistributing pressure because the patient has immersed excessively into the surface and is no longer being supported by it, but is actually resting on the underlying bed frame or support structure. The term critical immersion is defined as the “state at which increased deformation of the support surface has the effect of concentrating and increasing localized pressure (RESNA SS-1:2014). In other words, the support surface is not able to provide cushioning effect or pressure redistribution, because the interaction of the body on the support surface has surpassed the point where the support surface can generate a pressure redistribution response to the load that has been applied. This event can occur even where the body’s immersion is not yet pressing through the surface to the underlying structure.

For example:

A closed volume air cushion can be overwhelmed by the size and mass of an individual so that the air charge (air sealed within the cushion) reaches a compressed state that is high enough that cushion hardens and applies unmitigated forces to the tissue. In this state it cannot provide “pressure redistribution” and is considered to have passed the point of critical immersion.

A foam product can be loaded by a body whose size and mass combine so that elastic deformation of the foam can no longer occur to provide pressure redistribution in response to the load that is upon it.

These examples should be considered to be a function of the relationship of the size, shape, and mass of the individual who is using the product and the volume, air charge, elasticity and compressibility of the surfaces that they are on. This relationship is independent of the underlying structure and does not require what is traditionally thought of as “sit through” or “bottoming out” to pass the point of critical immersion and no longer provide pressure redistribution. In this state the tissues contacting the surface should be considered to be at pressure deformation risk.

## **Use of hand checks between a static air overlay and a mattress**

The hand check method was introduced in 1994 Clinical Practice Guidelines on the Treatment of Pressure Ulcers (AHCPR Publication No. 95-0652; Maklebust J. & Sieggreen M.) as a method to evaluate inflation and effectiveness of air mattress overlays and seat cushions. This subjective method was described as having the clinician slide a hand, palm side up, at the interface of the overlay and the mattress just under the patient's sacrum. If the clinician could feel the patient's sacrum resting in the palm of the hand or was not able to feel at least one inch of the inflated surface between the palm of the hand and the patient's sacrum, the patient was said to be "bottoming out". Health care facilities provide policies, procedures, and protocols for frequency and methods for clinicians to check for bottoming out. The Tag-F314 refers to the use of the hand check as a way to determine whether or not a resident is 'bottoming out' on a mattress overlay (<http://www.cms.gov/Regulations-and-Guidance/Guidance/Transmittals/downloads/R5SOM.pdf>). The use of hand checks was removed from the 2014 International Guidelines.

**Position of NPUAP:** Using the hand check method to determine bottoming out is a satisfactory but subjective method for air mattress overlays and chair cushions. It is acknowledged that there is currently not a more technologically advanced method that is readily available to all clinicians and research is needed in this area. Because bottoming out is a dynamic condition, it is subject to a number of variables and positioning may change the individual's immersion or depth into the support surface at any given time. During the course of a day in a health care facility, the individual is repositioned multiple times. The frequency of assessment is based on the patient's or resident's movement, the clinician's judgment and facility policy.

## **Use of hand checks on mattress replacement systems**

By 2000, the hand check was included in additional guidelines (Consortium for Spinal Cord Medicine 2008) to include not only mattress overlays but also mattress replacement systems such as foam, low air loss and alternating pressure surfaces. The concern about the use of hand checks on mattress replacements stems from safety issues for the provider and individual depending on where the clinician's hand was placed for assessment. Sophisticated support surfaces are secured with straps to hold the mattress replacement tightly on the frame. Additionally, many support surfaces use a safety perimeter to reduce the risk of falls and these covers may require a second set

of safety straps. Removal of the security straps by the clinician to do “hand check” increases a patient safety risk due to the uncertainty that these straps will be replaced correctly. If the clinician were attempting to check for bottoming out between the body and the surface there is a risk of skin injury to the individual. The Tag F 314 guidance does not include use of hand checks on mattress replacement systems.

### **Position of NPUAP**

There is no practical or purposeful reason to attempt a hand check on a mattress replacement. Research is needed to develop a method of evaluating mattress replacement system performance. Until such time, the clinician should follow the manufacturer’s recommendation.

### **Use of hand checks on integrated bed systems**

By 2000, the hand check was also included in additional guidelines for integrated bed systems (Delmarva 2014, MD/DC CMS 2014). It is unclear how the hand checks method could be performed on an integrated bed system such as an air fluidized support surface. Many mattresses and integrated bed systems in use today include self-diagnostic features that indicate proper immersion. These sophisticated surfaces are not designed to be taken apart at the bedside to reach the bottom of the bed. The concern with using hand checks on mattress replacements stems from safety issues for the provider depending on where the clinician’s hand was placed for assessment. The mechanical portions of the bed rest beneath the mattress and the hand could be injured in any attempt to assess for “bottoming out” in these types of integrated bed systems.

### **Position of NPUAP**

The use of hand checks for bottoming out in an integrated bed system is contraindicated. Research is needed to develop other methods of evaluating the performance of integrated bed systems. Until such time, the clinician should follow the manufacturer’s recommendation. A further issue for consideration is that of infection control. When considering support surfaces within a healthcare facility, the FDA has issued a cautionary alert to be vigilant in auditing the integrity of hospital mattresses. (<http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm348016.htm>). In light of that alert, there is insufficient evidence to support a clinician inserting an upper extremity within the closed structure of the integrated bed system. That action could precipitate a hazardous situation for the caregiver and the individual.

### **Consideration for the Utilization of the Hand Check Method**

- Hand checks are subjective.

- Hand checks can create the potential for infection risks for both the individual and the caregiver or clinician.
- Hand checks could create a shearing injury of fragile or moisture compromised skin (NPUAP 2014).
- Performance of a hand check for bariatric individuals may require multiple staff members, and the resultant repositioning alters the immersion making the hand check invalid.
- Hand check characteristics vary with the elevation of the head of the bed and patient positioning.
- The hand check method for assessing for bottoming out cannot be performed on certain therapeutic support surfaces related to product design.
- The hand check method has not been validated as a test. More research is needed on this subject.

### **Conclusion**

Hand checks have been historically used to assess “bottoming out” of static air mattress overlays at the bedside. This method is subjective but there is currently no other readily available method for the clinician/caregiver. The gap in the evidence indicates that additional research is needed to provide a bedside method to determine when a support surface has bottomed out.

This practice was carried over to therapeutic support surfaces and mattress replacement systems. No evidenced-based research could be found to validate the practice of using the hand checks method. With the advances in therapeutic support surfaces and mattress replacement systems, methods to monitor “bottoming out” have not kept pace with these new support surface technologies and the hand checks method is not an effective or safe assessment on these support surfaces. The gap in the evidence indicates that additional research is needed to provide a bedside method to determine when a support surface has bottomed out.

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- NPUAP 2014, per request by providers. Providers have been inappropriately cited for regulatory infringement in the field and this position paper is in response to requests for clarification of implementation of the hand check method.