RESEARCH LETTER

Evaluation of Sodium Levels in Hospital Patient Menus

Population-wide sodium reduction is a public health priority to address chronic diseases associated with excess sodium consumption. For such strategies to be effective, sodium reduction will need to occur in every segment of the food supply, including foods sold in grocery stores and restaurants as well as food served in public institutions such as hospitals. Guidelines for lowering sodium levels in hospital settings have recently been published but largely focus on consumer food service outlets rather than on foods served to inpatients. There are few published data describing sodium levels in hospital patient menus and determining whether these levels fall within recommended guidelines. The objectives of this study were to quantify the amount of sodium in commonly prescribed hospital patient menus and to determine whether these levels are in agreement with established sodium recommendations.

Methods. The sodium content of standard-unselected menus and consecutive patient-selected menus for regular, diabetic, and 3000- and 2000-mg sodium-restricted diet prescriptions at 3 acute care hospitals in Ontario, Canada (N = 1935 beds), was analyzed between November 2010 and August 2011. Assessment of patient-selected menus allowed us to evaluate the variations in sodium levels that occurred when patients self-select their foods. Combined diets (eg, diabetic and 2000-mg sodium restriction) and other diet types, such as texture modifications and kosher meals, were excluded. Nutritional analysis, which was conducted using manufacturer-specified data, included any ordered salt, snacks, and nutritional supplements. Research ethics board approval was obtained at each institution.

Sodium levels in regular and diabetic menus were compared with the adequate intake (AI) level of 1500 mg/d and the tolerable upper level (UL) of 2300 mg/d. Therapeutic sodium-restricted menus were compared with their respective cut points. Unpaired t tests and χ² tests were used for comparisons between the standard and the patient-selected menus.

Results. The final analysis included 84 standard-unselected menus for the 4 diet prescriptions and 633 regular, 628 diabetic, 630 3000-mg, and 343 2000-mg sodium patient-selected menus. Most menus came from general medical (27%), surgical (24%), and cardiology (20%) wards.

The mean (SD) sodium level in standard-unselected regular menus was 2896 (606) mg. Of these menus, 100% and 86% exceeded the AI and the UL, respectively (Table). Among patient-selected regular menus, 97% and 79% exceeded the AI and the UL, respectively. The mean (SD) sodium level in standard-unselected diabetic menus was 3406 (544) mg; 100% of the menus exceeded both the AI and the UL for sodium. Patient-selected diabetic menus contained similar sodium levels, with 99% of the menus exceeding the AI and 95% of the menus exceeding the UL.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Regular Menus</th>
<th></th>
<th></th>
<th></th>
<th>Diabetic Menus</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard (n = 21)</td>
<td>Patient Selected (n = 633)</td>
<td>P Value</td>
<td>Standard (n = 21)</td>
<td>Patient Selected (n = 628)</td>
<td>P Value</td>
<td></td>
</tr>
<tr>
<td>Sodium, mean (SD), mg</td>
<td>2896 (606)</td>
<td>3033 (937)</td>
<td>.33</td>
<td>3406 (544)</td>
<td>3600 (913)</td>
<td>.13</td>
<td></td>
</tr>
<tr>
<td>Menus with &gt;1500 mg of sodium</td>
<td>21 (100)</td>
<td>615 (97)</td>
<td>.55</td>
<td>21 (100)</td>
<td>623 (99)</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>Menus with &gt;2300 mg of sodium</td>
<td>18 (86)</td>
<td>497 (79)</td>
<td>.17</td>
<td>21 (100)</td>
<td>594 (95)</td>
<td>.32</td>
<td></td>
</tr>
<tr>
<td>Sodium/1000 calories, mean (SD), mg</td>
<td>1742 (262)</td>
<td>1679 (346)</td>
<td>.30</td>
<td>1883 (235)</td>
<td>1865 (374)</td>
<td>.73</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>3000-mg Menus</th>
<th></th>
<th></th>
<th></th>
<th>2000-mg Menus</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard (n = 21)</td>
<td>Patient Selected (n = 630)</td>
<td>P Value</td>
<td>Standard (n = 21)</td>
<td>Patient Selected (n = 343)</td>
<td>P Value</td>
<td></td>
</tr>
<tr>
<td>Sodium, mean (SD), mg</td>
<td>2401 (389)</td>
<td>2519 (678)</td>
<td>.20</td>
<td>1504 (296)</td>
<td>2041 (887)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Menus with &gt;2000 mg of sodium</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td>2 (10)</td>
<td>161 (47)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Menus with &gt;3000 mg of sodium</td>
<td>2 (10)</td>
<td>125 (20)</td>
<td>.13</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Menus with &gt;1500 mg of sodium</td>
<td>21 (100)</td>
<td>599 (95)</td>
<td>.35</td>
<td>9 (43)</td>
<td>229 (67)</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>Menus with &gt;2300 mg of sodium</td>
<td>12 (57)</td>
<td>381 (60)</td>
<td>.17</td>
<td>0</td>
<td>111 (32)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Sodium/1000 calories, mean (SD), mg</td>
<td>1510 (209)</td>
<td>1486 (280)</td>
<td>.62</td>
<td>915 (246)</td>
<td>1114 (382)</td>
<td>&lt;.001</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: NA, not applicable.

Continuous variables are expressed as mean (SD) and categorical variables as number (percentage). Statistical analyses comparing standard-unselected menus and patient-selected menus were conducted using unpaired t tests (continuous data) and χ² tests (categorical data). P < .05 is statistically significant.
For the 3000-mg sodium-restricted diet, standard-unselected and patient-selected menus contained similar levels of sodium, with the majority falling within prescribed levels (Table). For the 2000-mg sodium-restricted diet, the mean sodium level in patient-selected menus was significantly higher than that in the standard-unselected menus (2041 [887] mg vs 1504 [296] mg; \( P < .001 \)). The proportion of menus exceeding the 2000-mg prescription cut point was also significantly higher in patient-selected menus than in the standard-unselected menus (47% vs 10%; \( P < .001 \)).

Comment. We demonstrated that hospital patient menus contain excessive levels of sodium: 86% of regular and 100% of diabetic standard-unselected menus exceeded the UL of 2300 mg of sodium, and 100% of these menus exceeded the AI of 1500 mg. Sodium levels in the 2 sodium-restricted diets typically fell within prescribed levels; however, approximately half of all 2000-mg sodium-restricted menus exceeded that prescribed level when patients self-selected their food. This observation could have important clinical implications given the therapeutic necessity of sodium restriction in conditions such as decompensated heart failure.

There are very few published data on the sodium content of hospital patient menus. One small study from Switzerland found an average of 3760 mg of sodium in a standard menu. In another, 20% of renal menus contained sodium levels exceeding the prescribed 2300 mg. These studies, however, only assessed 1 type of menu and were conducted in a single center. Although in a different setting, sodium levels in long-term care facilities may contain up to 4390 mg/d. Taken together, these findings are explained by the fact that hospitals as well as other public institutions are increasingly serving prepared foods rather than preparing foods from unprocessed ingredients.

All hospitals studied used rethermalization technologies and menus largely composed of outsourced prepared foods. Although these are common elements of food service systems, our data may or may not be applicable to other hospitals. Furthermore, we chose to assess sodium levels in patient menus, although actual sodium consumption will vary with food intake.

The menus studied serve a large group of hospitalized individuals, many of whom are nutritionally vulnerable and/or have cardiovascular diagnoses for which sodium intake regulation is essential. Based on the growing reliance on prepared and processed foods in the hospital setting, our findings highlight the need for sodium-focused food procurement and menu-planning policies to lower sodium levels in hospital patient menus.

JoAnne Arcand, PhD, RD
Katherine Steckham
Roula Tzianetas, MSc, RD
Mary R. L’Abbe, PhD
Gary E. Newton, MD

Published Online: July 16, 2012. doi:10.1001/archinternmed.2012.2368

Author Affiliations: Department of Nutritional Sciences, Faculty of Medicine, University of Toronto (Drs Arcand and L’Abbe), and Departments of Medicine (Ms Steckham and Dr Newton) and Nutrition and Food Services (Ms Tzianetas), Mount Sinai Hospital, Toronto, Ontario, Canada.

Correspondence: Dr Arcand, Department of Nutritional Sciences, Faculty of Medicine, University of Toronto, 150 College St, FitzGerald Bldg, Toronto, ON M5S 3E2, Canada (joanne.arcand@utoronto.ca).

Author Contributions: Dr Arcand had full access to all of the data in the study and takes full responsibility for the integrity of the accuracy of the data analysis. Study concept and design: Arcand, Tzianetas, and Newton. Acquisition of data: Steckham. Analysis and interpretation of data: Arcand, Steckham, Tzianetas, L’Abbe, and Newton. Drafting of the manuscript: Arcand. Critical revision of the manuscript for important intellectual content: Arcand, Steckham, Tzianetas, L’Abbe, and Newton. Statistical analysis: Arcand and Tzianetas. Obtained funding: Newton. Administrative, technical, and material support: Arcand, Steckham, Tzianetas, and Newton. Study supervision: Arcand, Tzianetas, and L’Abbe.

Financial Disclosure: Dr Arcand receives fellowship funding from the Canadian Institutes of Health Research Program in Public Health Policy.

Funding/Support: This study was conducted with internal research funds.

Additional Contributions: We thank Lori Klin, RD, Jaclyn Nairn, RD, Heather Oliphant, BSc, Linda Stoyanoff, RD, and Heather Fletcher, RD, for their significant contributions to data collection and analysis.


INVITED COMMENTARY

A Call to Our Hospitals:
Please Hold the Salt!

Arcand et al1 and their documentation of universally high sodium content in the food that is served to inpatients at 3 large acute care facilities in Ontario, Canada, serve as a reminder of how far our health care institutions still need to go to remain consistent with their mission of curing the sick and promoting health. The implications of this important work are 3-fold.