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.[1] 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.[2,3] Guidelines for lowering sodium levels in hospital settings have recently been published but largely focus on consumer food service outlets

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rather than on foods served to inpatients.[4,5] 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.[6] Therapeutic sodium-restricted menus were compared with their respective cut points. Unpaired *t* tests and χ^2 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. Sodium Content of Menus for Regular, Diabetic, and 3000- and 2000-mg Sodium-Restricted Hospital Diets[a]

Variable	Regular Menus			Diabetic Menus		
	Standard (n = 21)	Patient Selected (n = 633)	*P* Value	Standard (n = 21)	Patient Selected (n = 628)	*P* Value
Sodium, mean (SD), mg	2896 (606)	3033 (937)	.33	3406 (544)	3600 (913)	.13
Menus with >1500 mg of sodium	21 (100)	615 (97)	.55	21 (100)	623 (99)	.85
Menus with >2300 mg of sodium	18 (86)	497 (79)	.17	21 (100)	594 (95)	.32
Sodium/1000 calories, mean (SD), mg	1742 (262)	1679 (346)	.30	1883 (235)	1865 (374)	.73
	3000-mg Menus			**2000-mg Menus**		
	Standard (n = 21)	Patient Selected (n = 630)	*P* Value	Standard (n = 21)	Patient Selected (n = 343)	*P* Value
Sodium, mean (SD), mg	2401 (389)	2519 (678)	.20	1504 (296)	2041 (887)	<.001
Menus with >2000 mg of sodium	NA	NA	NA	2 (10)	161 (47)	<.001
Menus with >3000 mg of sodium	2 (10)	125 (20)	.13	NA	NA	NA
Menus with >1500 mg of sodium	21 (100)	599 (95)	.35	9 (43)	229 (67)	.02
Menus with >2300 mg of sodium	12 (57)	381 (60)	.17	0	111 (32)	<.001
Sodium/1000 calories, mean (SD), mg	1510 (209)	1486 (280)	.62	915 (246)	1114 (382)	.002

Abbreviation: NA, not applicable.

[a]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 χ^2 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.[7] In another, 20% of renal menus contained sodium levels exceeding the prescribed 2300 mg.[8] 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.[9] 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.

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INVITED COMMENTARY

A Call to Our Hospitals: Please Hold the Salt!

Arcand et al[1] 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.

First, the finding of excessive sodium in the meals offered to patients with diabetes and those with sodium restrictions underscores the potential for inpatient food service to contribute to the exacerbation or slow resolution of the very conditions that may have led to the hospitalization, including the common salt-sensitive conditions of heart, kidney, and liver failure. Therapeutic goals and nutritional goals should be aligned, particularly for these conditions, and optimized to ensure the best outcomes in the hospital and in the ongoing care for these often chronic conditions.

Second, the finding of sodium content in excess of the recommended limit in nearly all of the menu offerings at these institutions suggests that most inpatients may not actually have the option to consume healthy levels of sodium while they are hospitalized. Importantly, Arcand and colleagues quantified the sodium that had already been added to these inpatient meals. Both within the hospital and outside the hospital, most of the sodium consumed in our Western diet is that which is already added to the processed, prepared, and/or packaged foods that we consume.[2,3] The choices of inpatients are also constrained by their physical confinement to the hospital and possibly by hospital rules restricting outside food and supplements. A critical first step toward increasing the healthy choices for hospitalized patients may be to prepare *all* meals with low sodium content and make optional table salt available for those patients who do not have additional restrictions. Interestingly, studies suggest that individuals who are left unencumbered to salt food during consumption rarely add sodium in quantities that match those that are already found in processed food formulations.[4]

Finally, Arcand and coauthors' study adds to the growing evidence of unhealthy food environments in our health care institutions. The list of concerns, which is long and varied, includes high sugar and fat content and excessive portion sizes for pediatric patients,[5] fast food restaurants on hospital premises,[6] and widespread reliance on vending machines after hours, with choices restricted to sodas and other items that are high in sugar.[7] The unhealthy food environment in these institutions affects not only patients but also hospital personnel, particularly those who are working after-hours shifts.[8,9]

Two decades ago, several US hospitals took steps to ban smoking on their premises. Although the explicit motivation was to protect the health of patients, these measures had the critically important additional impact of improving the health of hospital personnel (as measured by successful tobacco quit rates among hospital staff) and positioning health care institutions as leaders in the subsequent efforts to curb smoking in the workplace that have been instrumental in turning the tide on smoking rates in the United States.[10] Hospitals again have the opportunity to take the lead and to create food environments that are consistent with their mission to cure the sick and to promote health. Through the simple act of serving food that meets national nutritional standards, our hospitals will act in the best health interests of their patients, and their staff and will undoubtedly again be leaders in our ongoing dialogue on how to improve our food supply, which in turn will improve the health of us all.

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RESEARCH LETTERS

Improved Outcomes in Heart Failure Treated With High-Dose ACE Inhibitors and ARBs: A Population-Based Study

Elevated doses of angiotensin II–converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARBs) have similarly reduced morbidity and mortality in congestive heart failure (CHF) trials.[1,2] However, despite the recommendations of consensus CHF guidelines to achieve elevated target doses of ACE inhibitors or ARBs,[3,4] patients often receive doses that are lower than those used in large clinical trials, possibly owing to adverse effects.[2,5,6] We conducted a population-based retrospective cohort study to estimate the effect, in real-world clinical practice, of different doses of ACE inhibitors and ARBs on all-cause mortality and CHF readmission in patients with a first CHF admission.

Methods. Data on all patients 65 years or older who were admitted for a first CHF diagnosis in the province of Quebec, Canada, between January 1, 1998, and March 31, 2007, were obtained from the hospital discharge summary database of Quebec and the provincial physician