Prospective Determination of Noninvasive Clinical Correlates of Dehydration in Hospitalized Elderly

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This paper is one in a series of Faculty Research Reports that describes aging research conducted at the University of Minnesota. The All-University Council on Aging (AUCA) through the Center for Urban and Regional Affairs, supports three to four faculty research projects per year. The research may be in any field that has implications for the later stages of human life. The primary purpose of the program is to provide "seed" money for projects that have a good chance of developing, eventually, into larger scale projects with outside funding support. The final report for this project was forwarded to AUCA on April 21, 1989.

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PROSPECTIVE DETERMINATION OF NONINVASIVE CLINICAL CORRELATES OF DEHYDRATION IN HOSPITALIZED ELDERLY

ABSTRACT

Decreased thirst and diminished renal function contribute to dehydration in the elderly, as do risk factors such as chronic disease and medications. Dehydration is a leading cause of emergency room visits and a common admission diagnosis for the elderly. Numerous signs and symptoms have been identified as indicators of dehydration, yet the reliability and validity of these indicators has never been systematically evaluated for elderly populations. The purpose of this research was to document the reliability and validity of the clinical assessment of putative signs and symptoms of dehydration in an elderly sample. Indicators of dehydration identified in literature or used in practice were studied. Trained research nurse clinicians conducted exams on twenty subjects, 65 years and older. Two independent exams were performed consecutively to assess inter-observer agreement. Percent agreement, kappa statistics and correlation coefficients were used to estimate the levels of agreement between observers. Results on individual signs ranged from good (skin turgor on sternum, kappa = .64, $p < .01$) to poor (tongue dryness, kappa=.02, n.s.). In general, global indicators such as observed confusion showed greater reliability (Kendall's tau = .86, $p < .001$). Subjective reports of feelings of thirst and dryness were notably unreliable. Time passage between exams, hydrating interventions and patient positioning were factors found to impact reliability.

For validity assessment, an independent rating of the patients' dehydration status was made by retrospective chart review, using traditional criteria including laboratory values, history, and physical findings. The validity of the clinical signs and symptoms in the study dehydration assessment (first exam only) were evaluated by comparison to: 1) the independent traditional clinician's rating, and 2) patient age. Only confusion was related to age alone. However, only five patients were mildly (n=3) or moderately (n=2) dehydrated, and many of the cardinal signs of dehydration failed to significantly correlate with the clinician's gold standard dehydration rating. While these findings do not indicate an age-confounding effect, the lack of severely dehydrated and the small sample size prevented a more complete evaluation of validity.

As part of the expanded study, funded by the Retirement Research Foundation, the more reliable indicators will be further evaluated for validity in hospitalized, dehydrated elderly, as part of the protocol to develop a noninvasive clinical scale to assess dehydration in the elderly.

SUMMARY OF FINDINGS

This pilot project had several aims. These were to:

- Refine protocol and to establish effective procedures for patient induction and consent.
- Pilot measures and pre-test forms for clinical measures which have not been previously standardized.
- Develop subject selection and exclusion criteria.
- Characterize the group of elderly admitted with symptoms of dehydration as to their physical, social, psychological, and environmental circumstances.
- Test inter-rater reliability and validity.

The first three aims were all directed at developing the procedures for the expanded study. The findings related to these aims will be discussed here. The final two aims were related to the reliability and validity of the items in the dehydration assessment. The reliability results were described in a presentation for the Gerontological Society of America Annual Meeting that was held in November, 1988. The validity results are in the process of being written.

This pilot project clarified a number of major issues regarding: 1) patient selection criteria, and 2) feasibility of specific assessment items. The most important finding was the strong correlation observed between mental status and dehydration. In order to more simply obtain patient consent and ensure compliance with paper and pencil test instruments, the initial protocol required subjects to be alert, oriented and able to pass the Short Portable Mental Status Exam (SPMSE). These criteria eliminated many dehydrated subjects since increasing dehydration causes confusion. In addition, the SPMSE was not effective in discriminating between intellect and orientation. In the main study it has been eliminated. A second important finding was the difficulty in obtaining accurate weight measurements due to patient weakness, paralysis, bed cautions, amputations, etc. Although weight continues to be in the main protocol, we are not excluding subjects unable to stand on our accurate scale. A third finding was the usefulness of the study brochure in communicating study requirements to patients, families and professional colleagues.

Many of the items in the assessment battery proved difficult to administer, particularly those items requiring patient positioning, such as assessing neck veins or taking orthostatic pressures. While some of these items remain in the protocol, we are aware that their usefulness is limited by the likelihood of missing data.

A brochure describing the project is appended. Accepted abstracts and reprints may be obtained directly from the authors. Write:

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In the preliminary study the researchers were able to detect and correct major flaws in the study design. Additionally, the existence of feasibility data and evidence of ability to access and study this population enabled the co-investigators to attract external funding from the Retirement Research Foundation.

The School of Nursing provided substantial support in the form of secretarial support, literature searches, copying costs, as well as the travel expenses for Dr. Gross to attend the 1988 Gerontological Society of America meeting to present the study results.

PRODUCTS OF THE STUDY

External Funding Award of $97,882 from the Retirement Research Foundation to expand upon the pilot study.

Principal Investigators R.D. Lindquist and C.R. Gross
"A Noninvasive Scale for Assessing Early Stages of Dehydration in the Elderly: Development and Validation."
Dates of Award: January - December, 1989.

Development of the following research reports:

Manuscript (submitted)

Gross, C.R., Lindquist, R.D., Woolley, A.C., Granieri, R., Allard, K., Webster, B., Irvine, P., "Diagnosis of Dehydration in the Elderly."

Lindquist, R.D., Johnson, L.S., Robert, R.C., Gross, C.R., "Reliability of Clinical Assessment Measures of Dehydration in the Elderly."

Presentations

Allard, K., Lindquist, R., Gross, C., Johnson, L.W., and Webster, B., "Stress and Anxiety Associated with Acute Hospitalization of the Elderly." Gerontological Society of America, Minneapolis, MN. November 1989.

Gross, C.R., Lindquist, R.D., Robert, R., and Johnson, L., "Nursing Assessment of Dehydration in the Elderly: The Reliability of Clinical Indicators," Gerontological Society of America, San Francisco, CA. November 1988.

Johnson, L.W., Lindquist, R.D., Gross, C.R., Webster, B., Allard, K., "Changes in Mental Status: A Cornerstone of Dehydration Assessment?" Gerontological Society of America, Minneapolis, MN. November 1989.

Presentations at the University of Minnesota

Gross, C.R., "Reliability of Clinical Indicators of Dehydration in the Elderly," College of Pharmacy Faculty Research Seminar. March 31, 1989.

Gross, C.R., "Studying Dehydration in the Elderly", Department of Pharmacy Practice, Research in Progess Seminar. February 21, 1989.

Lindquist, R.D., "Oral Rehydration Therapy, A Promising Solution." Spring 1988.

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A research project funded by the Retirement Research Foundation. Conducted by the University of Minnesota School of Nursing in cooperation with St. Paul Ramsey Medical Center.

What is fluids research?

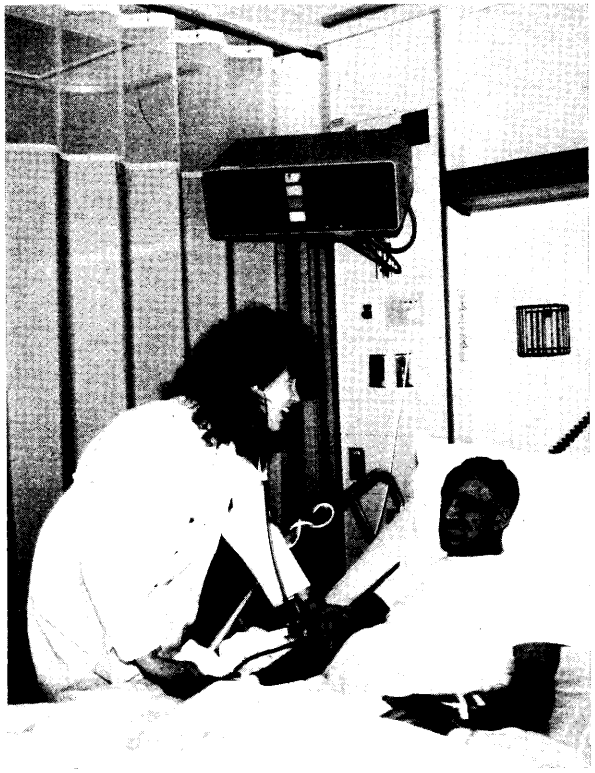
Fluids research is the study of how water loss affects the body. The project in which you are being asked to participate is designed to study these effects on persons aged 65 and older. Nurses and physicians from the University of Minnesota School of Nursing and St. Paul Ramsey Medical Center are conducting the study.

Who can participate in the study?

Patients aged 65 or older who are admitted to the Emergency Department of St. Paul Ramsey Medical Center may be asked to take part. If you agree to participate, a nurse researcher will obtain informed consent from you or a mutual consent from you and a family member.

What is the cost?

There is *no* cost to study participants. The project is funded through grants from the Retirement Research Foundation and the All-University Council on Aging of the University of Minnesota. It is being implemented by the University of Minnesota School of Nursing in cooperation with St. Paul Ramsey Medical Center.



What will participation in fluids research involve?

Soon after you are admitted, a nurse researcher will perform a physical assessment, take your medical history, and obtain blood, urine, and saliva samples. During your hospitalization, a nurse will visit you daily to monitor your blood tests and fluid therapy. After you are discharged from the hospital, a nurse will maintain contact with you, and will visit you at home in about a month.

Who will benefit?

This study is part of a research program aimed at improving the quality of life of older adults. We appreciate your interest and encourage your participation.