

A COMPARISON OF BLOOD PRESSURE READINGS TAKEN SIMULTANEOUSLY BY FACULTY AND STUDENTS

This research paper has implications for further study by teachers in the clinical area.

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IN THE clinical setting, judgmental decisions based upon collected physiological and psychological data cannot be expected to be better than the accuracy of these data."¹ This study concerns the accuracy of blood pressure readings taken by students in the second year of a four-year generic nursing program when compared to simultaneous readings made by a member of the school faculty.

The problem for this study was, therefore, how do blood pressure readings taken simultaneously by a student and her instructor compare. Gunn, Sullivan and Glor reported no significant differences between observer recordings of simultaneous blood pressure readings using either simultaneous anticubital or brachial procedures.² They, however, stated that "Because these studies used only two observers, the findings are merely suggestive and should be confirmed using multiple observers."³ In a study designed to test inter-observer reliability of blood pressure readings Glor, Sullivan and Estes found that there was no significant difference in either the systolic or diastolic measurements recorded by registered nurses, non-professional nursing attendants and student nurses.⁴

Putt, in a study designed to look at how blood pressure measurements taken by palpation of the brachial artery compare with readings obtained by auscultation of the same vessel,⁵ found that the mean dif-

ference in readings obtained on fifty patients by two independent observers both for simultaneous auscultation and palpation were well within "the mean error of 8.00 mm. of mercury that the American Heart Association states may be expected for individual readings of systolic and diastolic pressures in normal persons."⁶

OBSERVERS

The participating students were all completing their second year of a four-year baccalaureate nursing program. They had all received instruction in the physiology related to blood pressure measurement and the procedure to be followed when obtaining this particular data for assessment of patients' well being. During the year, students were provided with experience in caring for mothers during the maternity cycle. As a blood pressure record is one of the ways of assessment of physiological and psychological response of the mother to pregnancy, labour and delivery, it was a technical skill that the students were able to practice in a number of settings; doctor's office, labour and post-partum units. A limitation of this study, however, was that the amount of practice or previous difficulty experienced by individual students during the year may have differed and for this no control was provided.

The second observer in all cases was a faculty member from the university working with the student in the clinical area.

Twenty students and three instructors participated. This is another limitation of the study for observer control might have been greater if one instructor had participated throughout. However, this study had as its major objective stimulation of student interest in analysis of their own skills and, therefore, does not meet criteria in a number of areas that might be anticipated if it had been designed as a tightly controlled research project.

METHODOLOGY

All blood pressure readings were taken on patients in the first stage of labour to whom a student had been assigned. Using the auscultation method, blood pressure was measured indirectly using a mercury sphygmomanometer and dual stethoscope. Two simultaneous recorded blood pressures were obtained on the same subject, with one inflation of the cuff. Readings of each observer were recorded independently.

Hochberg and Westhoff reporting a study where simultaneous bilateral blood pressure readings were recorded, stated: "A majority of the population did not reveal large differences — that is, over 10

mm. Hg.”;⁷ however, the mean difference between the two arms for the systolic readings was 7.4 mm. Hg. and the diastolic 9.3 mm. Hg. It was felt that for the present study the use of the dual stethoscope would allow for simultaneous readings on the same arm thus negating this as a difference in readings.

Twenty paired observations were made in a two-week period on twenty different patients.

RESULTS

Tables 1 and 2 show the blood pressure readings as recorded by the observers and the frequency distribution of deviations. The deviations in systolic blood pressure readings ranged from +32 to -18 mm. of Hg. and the diastolic from +8 to -22 mm. of Hg. These findings are similar to those reported by Putt where deviations in blood pressure measurements taken simultaneously by auscultation and palpation ranged from +24 to -20 mm. of Hg. systolic and +30 to -22 mm. of Hg. diastolic, but are somewhat higher than she reported for simultaneous auscultation where the range for both systolic and diastolic measurements was +20 to -14 mm. of Hg.⁸

A comparison of the twenty paired blood pressure readings obtained simultaneously on twenty patients by students and faculty utilizing a dual stethoscope yielded a mean difference for systolic readings of 5.2 and for the diastolic readings of 5.95 mm. of Hg. These figures are well below the mean error of 8mm. of Hg. that the American Heart Association stated in 1951 may be expected in individual readings of systolic and diastolic pressures.⁹

TABLE 1

SIMULTANEOUS BLOOD PRESSURE READINGS TAKEN ON PATIENTS IN LABOUR
BY FACULTY MEMBERS AND STUDENTS

Systolic				Diastolic		
Subject	Faculty	Student	Deviation	Faculty	Student	Deviation
1	120	110	10	88	80	8
2	110	110	0	74	80	-6
3	178	175	3	100	100	0
4	134	134	0	88	88	0
5	116	115	1	80	80	0
6	118	105	13	70	80	-10
7	126	128	-2	86	88	-2
8	124	120	4	78	70	8
9	142	110	32	72	72	0
10	146	145	1	110	110	0
11	110	112	-2	80	95	-15
12	108	100	8	64	68	-4
13	120	120	0	86	82	4
14	110	110	0	62	68	-6
15	130	130	0	100	100	0
16	90	84	6	60	72	-12
17	90	92	-2	56	58	-2
18	108	126	-18	76	86	-10
19	108	110	-2	76	86	-10
20	108	108	0	68	90	-22
Total	2396	2344	+52	1574	-119	1653

TABLE 2
FREQUENCY DISTRIBUTION OF DEVIATION
OF BLOOD PRESSURE READINGS TAKEN
SIMULTANEOUSLY BY FACULTY MEMBERS
AND STUDENTS

Systolic	Deviation	Diastolic
1	+32	
1	+13	
1	+10	
1	+ 8	2
1	+ 6	
1	+ 4	1
1	+ 3	
2	+ 1	
6	0	6
4	- 2	2
	- 4	1
	- 6	2
	-10	3
	-12	1
	-15	1
1	-18	
	-22	1
N 20		N 20

The standard deviation for the systolic readings was 7.8 mm. of Hg. and for diastolic readings 5.85 mm. of Hg. indicating somewhat greater variability in deviations than in Putt's study where the systolic standard deviation was 5.77 mm. of Hg. and for the diastolic readings 4.23 mm. of Hg.

A t- test for paired data was calculated and was significant beyond the .05 level for both systolic and diastolic readings, indicating that there was a significant difference in mean for both systolic and diastolic measurements recorded by faculty and students.

A nonparametric sign test was also calculated and at the .05 level of significance there was no significance in the direction of difference $Z = 0.8$ for the systolic readings. For the diastolic readings, however, $Z = -2.41$ was significant at the .05 level, the faculty getting a significant number of readings that were lower than the students recorded.

TABLE 3
COMPARISON OF SIMULTANEOUSLY OBTAINED
BLOOD PRESSURE READINGS TAKEN BY
AUSCULTATION OF THE BRACHIAL ARTERY

	Systolic	Diastolic
Simultaneous Auscultation N = 20		
Mean difference	5.2	5.95
Standard deviation	7.8	5.85
t-test	2.91 p < .05	4.44 p < .05
sign test	0.8 p > .05	-2.41 p < .05

IMPLICATIONS FOR NURSING PRACTICE

The mean difference in blood pressure readings between observers fell well within the mean error that the American Heart Association suggested was acceptable; however, 4 of the 20 systolic readings were outside the limits of 8 mm. of Hg. and 6 of the diastolic readings. In the case of the diastolic readings there was a significant tendency for the students to have higher readings than the faculty observer. Further exploration of their understanding of the measurement of diastolic blood pressure should be carried out with the students. Periodic checks using the dual stethoscope might be initiated to determine difficulties.

SUMMARY

A comparison of blood pressure readings obtained simultaneously by auscultation of the brachial artery on twenty patients in first stage labour by two observers, one of a faculty member and the other a student in the second year of the four-year generic program, yielded a mean difference of 5.2 mm. of Hg. for systolic readings and 5.95 mm. of Hg. for the diastolic readings. The standard deviations were systolic 7.8 mm. of Hg. and diastolic 5.85 mm. of Hg. The t-test, for testing difference between means for paired data, was significant at the .05 level for both systolic and diastolic measurements.

The sign test showed a $z = 0.8$ for the systolic reading and -2.41 for the diastolic readings. The standard score was significant at the .05 level for the diastolic readings but not significant for the systolic readings.

The statistical analysis showed a significant difference between the readings of faculty and students, but the mean differences were within the ± 8 mm. of Hg. considered acceptable by the American Heart Association.

References

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3. *Ibid.*, p. 11.
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5. Putt, Arlene M. "A Comparison of Blood Pressure Readings by Auscultation and Palpation." *Nursing Research*, 15:311, Fall 1966.
6. *Ibid.*, p. 316.
7. Hochberg, Anita, and Mary Elizabeth Westoff. "Simultaneous Bilateral Blood Pressures." *ANA Clinical Conferences*, American Nurses' Association, Minneapolis/Atlanta, 1969. New York: Appleton-Century, Crofts, 1970, p. 223.
8. Putt, *op. cit.*, p. 312-313.
9. American Heart Association, Committee to Revise Standards of Blood Pressure Readings. "Recommendations for Human Blood Pressure Determinations by Sphygmomanometers." *Journal of American Medical Association*, 147:632.