

**DIAGNOSTIC ULTRASOUND IN B.C.**

**1979 TO 1984**

HMRU Report 86:1

Division of Health Services  
Research and Development  
Office of the Coordinator of Health Sciences  
The John F. McCreary Health Sciences Centre  
The University of British Columbia  
Vancouver, British Columbia  
V6T 1Z6

Claire Kinnis  
Morris L. Barer

February 1986

### ACKNOWLEDGEMENTS

The assistance of Ms. Eileen Guiliani, British Columbia Ultrasonographers' Society, and Dr. Peter Cooperberg, Vancouver General Hospital is gratefully acknowledged. This research was supported by the B.C. Ministry of Health.

## HEALTH MANPOWER RESEARCH UNIT

C/O OFFICE OF THE COORDINATOR  
HEALTH SCIENCES CENTRE

PHONE: (604) 228-4810

4th FLOOR I.R.C. BUILDING  
THE UNIVERSITY OF BRITISH COLUMBIA  
VANCOUVER, B.C., CANADA  
V6T 1Z6

February 19, 1986

Mr. D.S. Haazen  
Chairman  
Health Manpower Working Group  
Ministry of Health  
1515 Blanshard Street  
Victoria, B.C.  
V8W 3C8

Dear Mr. Haazen:

It gives me pleasure to submit the report, "Diagnostic Ultrasound in B.C., 1979 to 1984", to the Health Manpower Working Group. This represents the second formal report on diagnostic ultrasound arising out of our five years of data collection.

We would welcome any comments you have on the contents of the report, or on future research extensions.

Yours sincerely,



Morris L. Barer, Ph.D.  
Associate Director  
Division of Health Services  
Research and Development

MLB:kc





## TABLE OF CONTENTS

	<u>Page</u>
List of Figures	ii
List of Tables	iii
INTRODUCTION	1
I. FACILITIES	1
II. ROOMS AND MACHINES	5
III. PROCEDURES	7
Methods	7
Results	9
IV. STAFFING	18
Staffing Problems, Training Programs and Future Staffing Requirements	20
V. THE PUBLIC/PRIVATE MIX OF ULTRASOUND FACILITIES	21
VI. SUMMARY	21
Appendix 1	
Appendix 2	

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Distribution of Ultrasound Capacity Among B.C. Acute Care Facilities, By Size of Facility, 1979 to 1984, Showing Additional Number Expecting to Provide Ultrasound by 1986.	4
2	Ultrasound Procedures, 1979 to 1984, By Geographic Region	11
3	Ultrasound Procedures, 1980 to 1984, By Admission Status	12
4	Ultrasound Procedures, 1979 to 1984, By Procedural Mix	14

LIST OF TABLES

<u>Table</u>		<u>Page</u>
1	Number of Facilities Surveyed, By Geographic Region and Size of Facility, Showing Number Providing Ultrasound and Number Expected to Within Two Years, B.C., 1984	2
2	Rates of Growth in Ultrasound Capacity, 1979 to 1984	5
3	Number of Machines in Use at December 31, 1982 and 1984, By Type of Machine, Showing Number on Order at December 31, 1984	6
4	Number of Ultrasound Procedures, By Geographic Region, Procedural Area and Admission Status, 1984	9
5	Rates of Growth in the Number of Ultrasound Procedures, 1979 to 1984	10
6	Rates of Growth in the Number of Obstetrical Ultrasound Procedures per Reported Delivery, 1979 to 1984, and Per Reported Delivery and Terminated Pregnancy, 1979 to 1983	15
7	Rates of Growth in the Number of Ultrasound Procedures per Acute Care Bed and per 1,000 Population, 1980 to 1984	17
8	Diagnostic Medical Sonographers in B.C., 1979 to 1984	18
9	Future Self-Reported Staffing Requirements, 1984	21



DIAGNOSTIC ULTRASOUND IN B.C.  
1979 TO 1984

INTRODUCTION

Since 1979 the Health Manpower Research Unit has been monitoring the provision and utilization of diagnostic ultrasound facilities in British Columbia.

In the past, the method of data collection was through a questionnaire administered to all public general hospitals known or thought to be providing the service. This year (1984), the study population was expanded to include all facilities with rated acute care beds, diagnostic and treatment centres and various private hospitals and clinics, all of which were extracted from the Hospital Programs list of the Ministry of Health, as well as four private practices which were known to be providing the service.

Questionnaires were mailed to the survey population, along with return-addressed, stamped envelopes. Second mailings and, in a few cases, telephone calls were utilized to obtain a 100 percent response rate. A copy of the questionnaire appears as Appendix 1.

I. FACILITIES

The 112 facilities surveyed are displayed in Table 1, cross-tabulated by geographic region and size, in terms of rated number of

TABLE 1: NUMBER OF FACILITIES SURVEYED, BY GEOGRAPHIC REGION AND SIZE OF FACILITY, SHOWING (NUMBER PROVIDING ULTRASOUND) AND [NUMBER EXPECTED TO WITHIN TWO YEARS], B.C., 1984.

<u>HMRU REGION</u> <sup>2</sup>	<u>RATED NUMBER OF ACUTE CARE BEDS</u> <sup>1</sup>						<u>N/A</u> <sup>3</sup>	<u>TOTAL</u>
	<u>&gt;500</u>	<u>401-500</u>	<u>301-400</u>	<u>201-300</u>	<u>101-200</u>	<u>&lt;100</u>		
GVRHD	2(2) <sup>4</sup>	2(2)	3(3)	1(1)	7(6)[1] <sup>5</sup>	2(2)	3(2)[1]	20(18)[2]
CAPITAL		2(2)				2(1)	1(1)	5(4)
FRASER VALLEY					4(4)	2(1)[1]		6(5)[1]
OKANAGAN				1(1)	2(2)	5	1	9(3)
SOUTH-EAST					1(1)	16(2)[4]	2	19(3)[4]
ISLAND COAST				1(1)	3(3)	14(3)[1]	1	19(7)[1]
CENTRAL			1(1)			9(2)	2	12(3)
NORTH CENTRAL				1(1)	1(1)	12(4)[1]	2	16(6)[1]
NORTH						5(3)[1]	1	6(3)[1]
TOTAL	2(2)	4(4)	4(4)	4(4)	18(17)[1]	67(18)[8]	13(3)[1]	112(52)[10]

<sup>1</sup> Approved operating capacity, B.C. Hospital Programs, March 31, 1984.

<sup>2</sup> Regional Hospital Districts arbitrarily grouped into 9 regions by the Health Manpower Research Unit (HMRU) - see map in Appendix 2.

<sup>3</sup> This group comprises private offices known to provide ultrasound, plus diagnostic and treatment centres, and other such facilities with holding beds only, from the Hospital Programs list of the Ministry of Health.

<sup>4</sup> Numbers in round brackets provided ultrasound in 1984.

<sup>5</sup> Numbers in square brackets expect to provide ultrasound within 2 years of 1984.

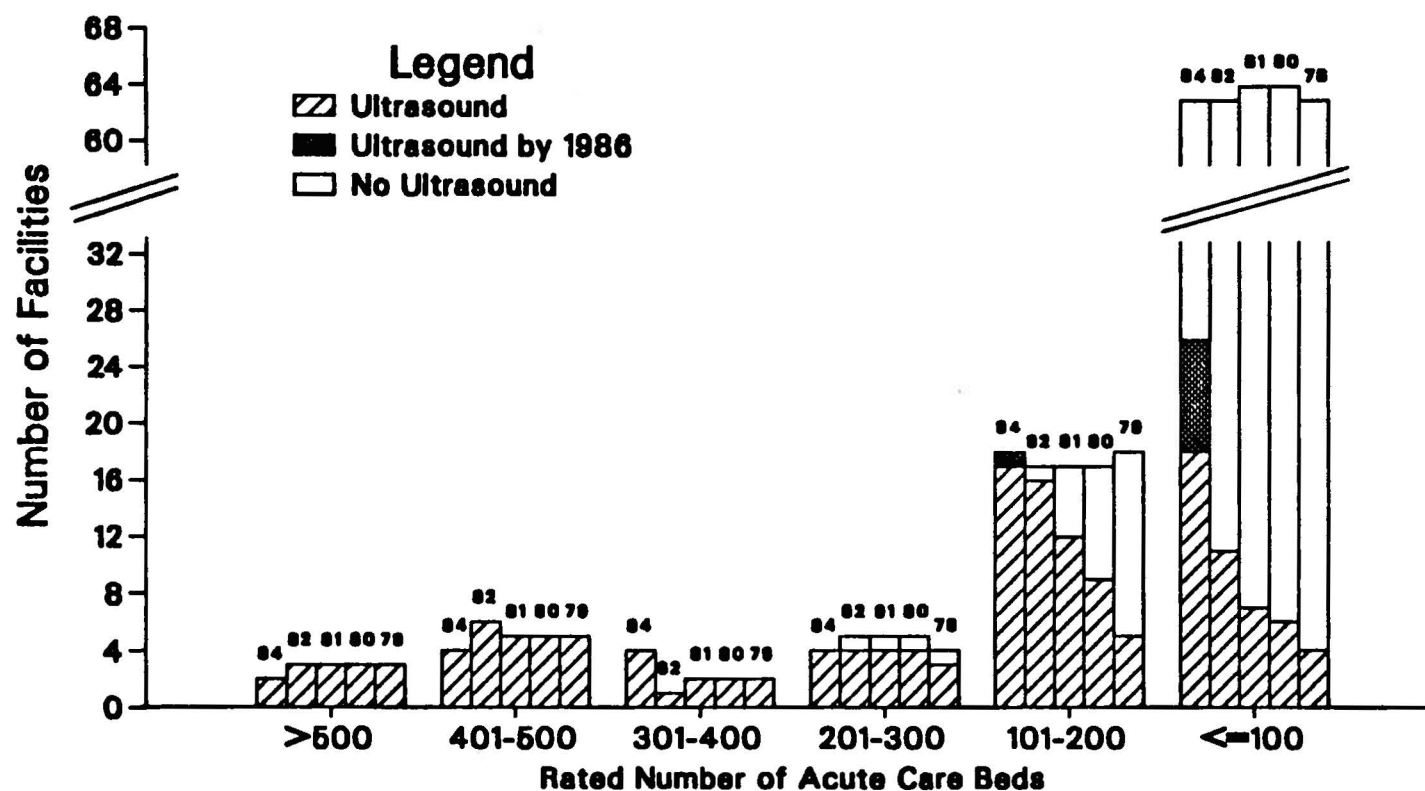
acute care beds. As can be seen, the largest facilities are located in the Greater Vancouver Regional Hospital District (GVRHD) and Capital Region, while many small facilities (100 beds or fewer) are dotted among the South-East, Island Coast and North Central regions of the province (see map - Appendix 2).

Table 1 also shows the number of facilities in each region which provided ultrasound in 1984 and the number expecting to within two years. Overall, 52 (46%) of all surveyed facilities were providing the service in 1984, with another 10 (9%) expecting to within two years, that is, by 1986. Although only three (16%) of the 19 facilities in the South-East were providing the service, another four (21%) were expecting to within two years. One hundred percent of facilities in the GVRHD and Fraser Valley provide ultrasound, or will, within two years.

Figure 1 illustrates the dramatic increase in the availability of ultrasound services among the smaller acute care facilities since 1979. The largest facilities (over 300 beds) were all providing this service in 1979. In the 101-300 bed groups, complete provision has been reached, or will have been reached, by 1986. In the smallest size group (but the one containing two-thirds of all facilities with acute care beds), provision has increased from four (6%) of 67 facilities in 1979 to 18 (27%) of 67 in 1984 with another eight (12%) expected to offer the service within two years. In total, the number of acute care facilities providing ultrasound has increased from 22 in 1979 to 49 in 1984, representing an average annual rate of growth of 17 percent.

The total number of facilities providing ultrasound (acute care

**Figure 1: DISTRIBUTION OF ULTRASOUND CAPACITY AMONG  
B.C. ACUTE CARE FACILITIES, BY SIZE OF FACILITY, 1979 TO 1984,  
SHOWING ADDITIONAL NUMBER EXPECTING TO PROVIDE ULTRASOUND BY 1986**





facilities and others) increased at an average annual growth rate of 19 percent (from 22 in 1979 to 52 in 1984)(Table 2).

## II. ROOMS AND MACHINES

The number of rooms utilized for ultrasound between 1979 and 1984 grew in line with the increase in the number of providing facilities (Table 2). As a result, the number of rooms utilized per facility increased only slightly.

Departments identified for the eight new rooms opened in 1984 were Radiology or X-Ray (5) and Obstetrics, Echocardiography and Ultrasound (1 each).

TABLE 2: RATES OF GROWTH IN ULTRASOUND CAPACITY  
1979 TO 1984

	<u>NUMBER</u>		<u>AVERAGE ANNUAL RATE OF GROWTH(%)</u>
	<u>1979</u>	<u>1984</u>	
FACILITIES PROVIDING ULTRASOUND	22	52 <sup>1</sup>	18.77
ROOMS UTILIZED	38	92	19.34
ROOMS UTILIZED/PROVIDING FACILITY	1.73	1.77	0.46
MACHINES UTILIZED	79	187	18.81
MACHINES UTILIZED/PROVIDING FACILITY	3.59	3.60	0.06
MACHINES UTILIZED/ROOM	2.08	2.03	-0.49

<sup>1</sup> Including 3 facilities with no rated beds

The number of machines in use increased from 79 in 1979 to 187 in 1984, representing an annual rate of growth of 19 percent, not appreciably

different from the rates of growth for rooms and facilities. Machines per providing facility remained unchanged at 3.6, while machines per room actually decreased slightly, from 2.1 to 2.0.

TABLE 3: NUMBER OF MACHINES IN USE AT DECEMBER 31, 1982 AND 1984, BY TYPE OF MACHINE, SHOWING NUMBER ON ORDER AT DECEMBER 31, 1984

DESCRIPTION OF MACHINE	NUMBER IN USE		NUMBER IN USE		NUMBER ON ORDER	
	DEC	31/82	DEC	31/84	DEC	31/84
	N	%	N	%	N	%
CONVENTIONAL B-SCAN	41	29.3	43	23.0	1	7.1
REAL-TIME (LINEAR ARRAY)	19	13.6	26	13.9	2	14.3
REAL-TIME (SECTOR FORMAT)	47	33.6	58	31.0	9	64.3
INTEGRATED INTO B-SCAN	-	-	5	2.7		
REAL-TIME (LINEAR + SECTOR)	1	0.7	10	5.3	1	7.1
+ CONVENTIONAL B-SCAN	-	-	1	0.5		
M-MODE (DEDICATED)	10	7.1	6	3.2		
M-MODE WITH SECTOR SCAN	9	6.4	16	8.6		
+ REAL-TIME (SECTOR)	-	-	4	2.1	1	7.1
M-MODE WITH SECTOR SCAN OR LINEAR	-	-	5	2.7		
M-MODE (DEDICATED + SECTOR)	1	0.7	-	-		
+ REAL-TIME (SECTOR)	1	0.7	-	-		
M-MODE + REAL-TIME (SECTOR)						
+ PULSE DOPPLER	-	-	3	1.6		
DEDICATED EYE UNITS	8	5.7	7	3.7		
DOPPLER	2	1.4	2	1.1		
SMALL PARTS	-	-	1	0.5		
A-MODE	1	0.7	-	-		
TOTAL MACHINES	140	100.0	187	100.0	14	100.0

The types of machines in use at the end of 1982 and 1984 are described in Table 3. Conventional B-Scan, Real-Time (Linear Array) and Real-Time(Sector Format) comprised 68 percent of all machines in use at December 31, 1984, down somewhat from the 76 percent of two years earlier, as more combinations of machine types came into use. Fourteen additional machines were already on order at the end of 1984, mostly (64%) Real-Time (Sector Format).

### III. PROCEDURES

#### Methods

Respondents were asked to provide data on the number of ultrasound procedures performed, broken down into five procedural areas, and inpatient/outpatient mix. They were also asked (1984 only) to indicate if the data were for the calendar or fiscal year. There are resultant problems in estimation, and those pertaining in 1984 are described in the following paragraphs.

(i) Twenty facilities provided fiscal and 34 provided calendar year data. For two facilities, each with two separate departments providing ultrasound services, one department reported on a fiscal, the other on a calendar year basis. Two facilities provided no fiscal/calendar information. Of total procedures, 58,813 (29%) refer to the fiscal year, 138,473 (68%) to the calendar, while 6,235 (3%) were unspecified.

(ii) For one facility which provided no information, the required data concerning procedures was obtained from the physician fee-item billing data from the Medical Services Plan tapes. These data are different again, being those procedures paid during the fiscal year.

(iii) Five facilities provided totals by procedural area and by the inpatient/outpatient split, but not the detailed cross-classification. Here the total inpatient/outpatient mix was applied to each procedural area total to obtain the required cross-classification (23,554 procedures, 11.6% of total).

(iv) One facility provided the required data for nine months only. Here, all data were extrapolated linearly to the 12 month period (3,880 procedures, 1.9% of total).

(v) Three facilities provided totals by procedural area only. Here, depending on the location of the facility, i.e. GVRHD or other B.C., the respective inpatient/outpatient mix in facilities providing the information was used to obtain the required estimates (17,674 procedures, 8.7% of total).

(vi) Three facilities provided the grand total only (one was the number rounded to the nearest thousand). For these, depending again on location, GVRHD or other B.C., the respective procedural mix in facilities providing the information was used to obtain procedural totals, then the respective inpatient/outpatient mix for the appropriate region (GVRHD or other B.C.) was applied to the marginals (6,107 procedures, 3.0% of total).

Thus, considering only the last four items above, for about 25 percent of procedures, the figures in the body of Table 4, i.e. the number of each type of procedure done on an inpatient or outpatient basis, are estimates. For about 12 percent of procedures, the inpatient/outpatient totals are estimates. For three percent, the procedural totals are estimates.

In earlier years, almost all facilities reported procedural information on a calendar basis, and adjustments similar to those described here were used as necessary to estimate detailed procedural information.

TABLE 4: NUMBER OF ULTRASOUND PROCEDURES, BY GEOGRAPHIC REGION, PROCEDURAL AREA AND ADMISSION STATUS, 1984

PROCEDURAL AREA	<u>GVRHD</u>					
	<u>INPATIENT</u>		<u>OUTPATIENT</u>		<u>TOTAL</u>	
	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>	<u>N</u>	<u>%</u>
OBSTETRICAL	3,456	11.4	26,274	33.1	29,730	27.1
EYE	299	1.0	2,268	2.9	2,567	2.3
CARDIAC	5,789	19.1	12,092	15.2	17,881	16.3
ABDOMINAL/PELVIC	17,593	58.0	34,603	43.6	52,196	47.6
OTHER	<u>3,199</u>	<u>10.5</u>	<u>4,192</u>	<u>5.3</u>	<u>7,391</u>	<u>6.7</u>
TOTAL	30,336	100.0	79,429	100.0	109,765	100.0
(%)	( 27.6)		( 72.4)		(100.0)	
<u>OTHER B.C.</u>						
OBSTETRICAL	3,896	19.6	29,012	39.3	32,908	35.1
EYE	126	0.6	305	0.4	431	0.5
CARDIAC	2,184	11.0	4,928	6.7	7,112	7.6
ABDOMINAL/PELVIC	12,453	62.8	37,189	50.3	49,642	52.9
OTHER	<u>1,183</u>	<u>6.0</u>	<u>2,480</u>	<u>3.4</u>	<u>3,663</u>	<u>3.9</u>
TOTAL	19,842	100.0	73,914	100.0	93,756	100.0
(%)	( 21.2)		( 78.8)		(100.0)	
<u>TOTAL</u>						
OBSTETRICAL	7,352	14.7	55,286	36.1	62,638	30.8
EYE	425	0.8	2,573	1.7	2,998	1.5
CARDIAC	7,973	15.9	17,020	11.1	24,993	12.3
ABDOMINAL/PELVIC	30,046	59.9	71,792	46.8	101,838	50.0
OTHER	<u>4,382</u>	<u>8.7</u>	<u>6,672</u>	<u>4.4</u>	<u>11,054</u>	<u>5.4</u>
TOTAL	50,178	100.0	153,343	100.0	203,521	100.0
(%)	( 24.7)		(75.3)		(100.0)	

### Results

There were almost 204,000 ultrasound procedures performed in 1984 in B.C., 25 percent on inpatients and 75 percent on outpatients (Table 4). Almost one-third of the total were obstetrical and one-half abdominal/pelvic. There were 109,765 (54%) procedures performed in the GVRHD and 93,756 (46%) in

other regions of the province. Over the period 1979 to 1984, total procedures grew in number from 69,487 to 203,521, representing an annual growth rate of 24 percent (Table 5).

TABLE 5: RATES OF GROWTH IN THE NUMBER OF ULTRASOUND PROCEDURES  
1979 TO 1984

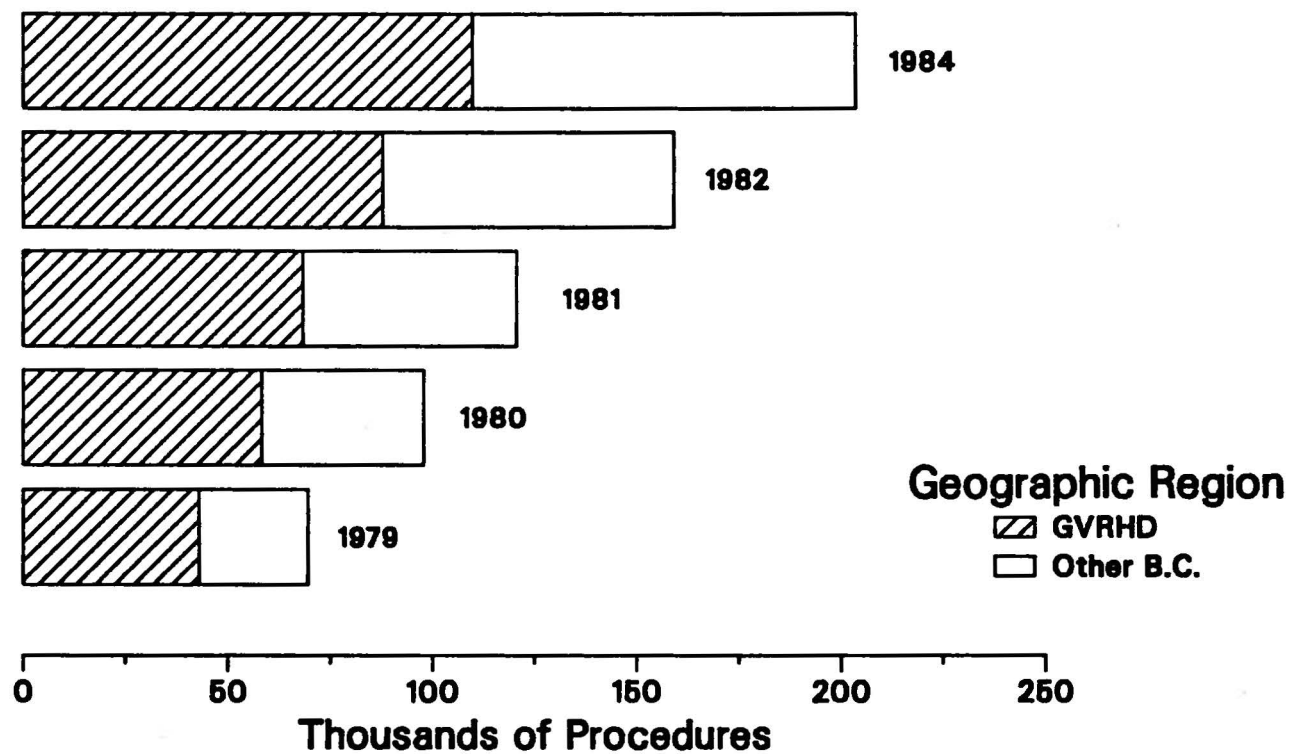
	<u>NUMBER</u>		<u>AVERAGE ANNUAL RATE OF GROWTH (%)</u>
	<u>1979</u>	<u>1984</u>	
TOTAL PROCEDURES	69,487	203,521	23.98
HMRU REGION:			
GVRHD	42,931	109,765	20.65
OTHER B.C.	26,556	93,756	28.70
PROCEDURAL MIX:			
OBSTETRICAL	27,784	62,638	17.65
EYE	836	2,998	29.10
CARDIAC	9,873	24,993	20.41
OTHER	30,994	112,892	29.50
(ABDOMINAL/PELVIC)	(56,231) <sup>1</sup>	(101,838)	(21.89)
(OTHER)	( 4,246) <sup>1</sup>	( 11,054)	(37.57)

<sup>1</sup> These are 1981 figures. Commencing that year "Other" was broken down into "Abdominal/Pelvic" and "Other". Rate of growth calculated 1981 to 1984.

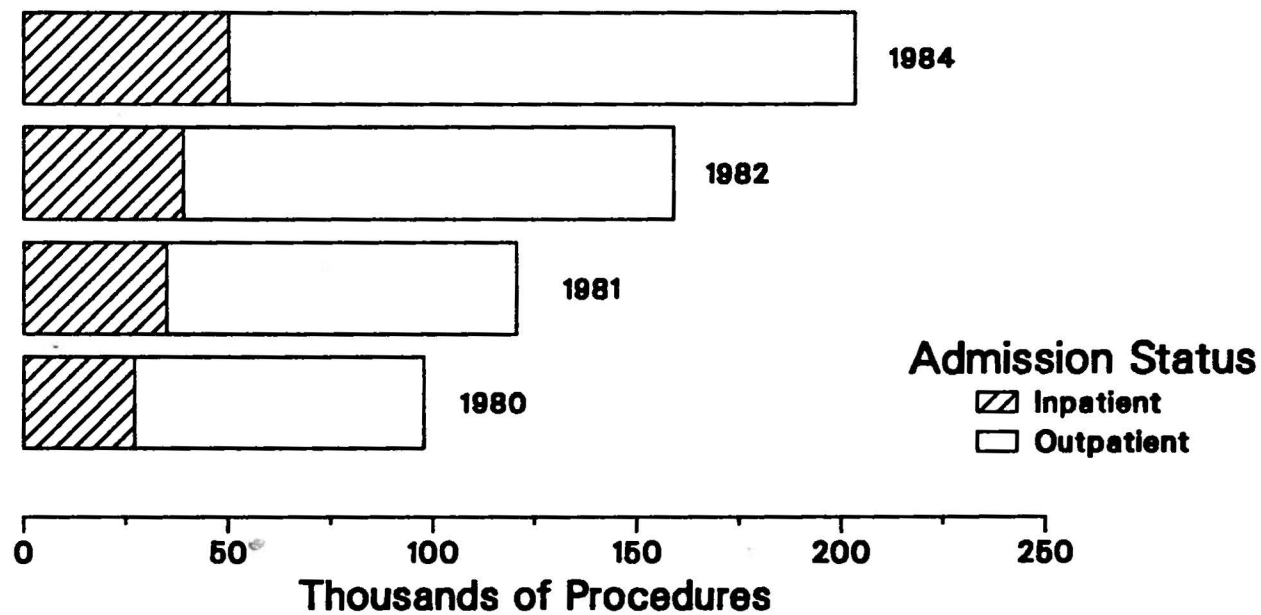
The breakdown by geographic region over the years 1979 to 1984 is displayed in Figure 2. A gradual shift from GVRHD to other B.C. is apparent, a result of the continued dispersion of the technology to the smaller rural hospitals. The annual rate of growth for GVRHD has been 21 percent (from 42,931 in 1979 to 109,765 in 1984), compared to 29 percent for other B.C. (from 26,556 to 93,756) (Table 5).

The annual rate of growth for inpatient procedures has been 17 percent, compared to 21 percent for outpatients (Figure 3) over the period

**Figure 2: ULTRASOUND PROCEDURES, 1979 TO 1984,  
BY GEOGRAPHIC REGION**



**Figure 3: ULTRASOUND PROCEDURES, 1980<sup>1</sup> TO 1984,  
BY ADMISSION STATUS**



<sup>1</sup>Admission status data not available for 1979.



1980 to 1984 (1979 data not available). Thus, outpatient procedure growth has exceeded that for inpatients, resulting in outpatient procedures representing 75% of all procedures in 1984, in contrast to about 72% in 1980.

Procedural mix is displayed in Figure 4 (and reported in Table 5). Obstetrical and cardiac procedures increased proportionately less than others, at annual growth rates of 18 and 20 percent, respectively. Abdominal/pelvic were separated out from "Other", commencing in 1981. These have since increased at an annual rate of growth of 22 percent, and in 1984 comprised 50 percent of all procedures.

In Table 6 we focus more closely on the relationship between obstetrical ultrasound services, and the target population. An 'ideal' denominator would be number of pregnancies during the period of interest, adjusted perhaps for relative ultrasound use by trimester and mix of pregnancies by trimester. In the absence of this sort of detail, we developed a denominator embodying all still and live births, plus all other terminated pregnancies reported from acute care and day care facilities in the province. Terminated pregnancies included any discharge record showing an ICD-9 code of 630.0 - 637.9.

Table 6 is divided into two sections. The first covers the entire period 1979 to 1984, but relates obstetrical ultrasound procedures to a denominator of births only. The second half of the table contains data for 1979 and 1983, related to the denominator of all terminated pregnancies (whether by birth or abortion). The split of terminated pregnancies between GVRHD and the rest of the province is an estimate, based on the average ratio of GVRHD/total B.C. for the period 1979 to 1982. This series ends in 1983 because we did not have data on

Figure 4: ULTRASOUND PROCEDURES, 1979 TO 1984,  
BY PROCEDURAL MIX

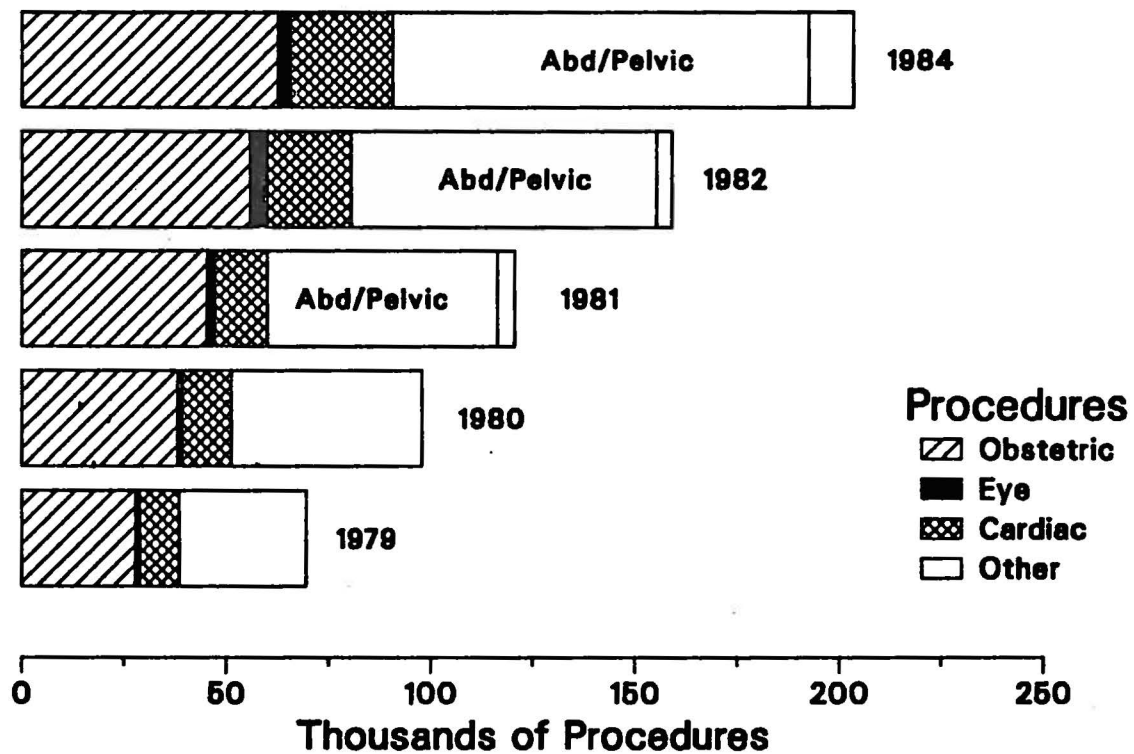


TABLE 6: RATES OF GROWTH IN THE NUMBER OF OBSTETRICAL ULTRASOUND PROCEDURES PER REPORTED DELIVERY, 1979 TO 1984, AND PER REPORTED DELIVERY AND TERMINATED PREGNANCY, 1979 TO 1983

	NUMBER		AVERAGE ANNUAL RATE OF GROWTH %
	1979	1984	
OBSTETRICAL ULTRASOUND PROCEDURES:	27,784	62,638	17.65
GVRHD	14,992	29,730	14.67
OTHER B.C.	12,792	32,908	20.80
REPORTED DELIVERIES (LIVE & STILL BIRTHS) <sup>1</sup> :	38,730	44,343	2.74
GVRHD	14,608	17,483	3.66
OTHER B.C.	24,122	26,860	2.17
OBSTETRICAL ULTRASOUND PROCEDURES PER REPORTED DELIVERY:	0.72	1.41	14.39
GVRHD	1.03	1.70	10.54
OTHER B.C.	0.53	1.23	18.34
	<u>1979</u>	<u>1983</u>	
OBSTETRICAL ULTRASOUND PROCEDURES:	27,784	60,000 <sup>2</sup>	21.22
GVRHD	14,992	27,500 <sup>2</sup>	16.38
OTHER B.C.	12,792	32,500 <sup>2</sup>	26.25
REPORTED DELIVERIES (LIVE & STILL BIRTHS) AND ABORTIONS <sup>3</sup> :	56,499	59,920	1.48
GVRHD	23,777	25,115 <sup>4</sup>	1.38
OTHER B.C.	32,722	34,805 <sup>4</sup>	1.55
OBSTETRICAL ULTRASOUND PROCEDURES PER REPORTED DELIVERY AND ABORTION:	0.49	1.00	19.52
GVRHD	0.63	1.09	14.69
OTHER B.C.	0.39	0.93	24.27

<sup>1</sup> Source: Division of Vital Statistics, Ministry of Health - Annual reports and personal communication.

<sup>2</sup> Data estimated graphically from the available data collected for 1979 to 1982 and 1984.

<sup>3</sup> Source: Hospital Programs Inpatient Hospital Discharge and Surgical Day Care tapes. Abortion data are for the fiscal years 1979-80 and 1983-84, and include ICD-9 codes 630-37 (ectopic pregnancies and other negative outcomes, spontaneous, legally induced and other abortions. 1984-85 data are not available at time of writing.

<sup>4</sup> Regional breakdown for abortion data included in these figures not available. Estimates based on average percentages occurring in the previous 4 years (51.3% GVRHD).

abortions for the 1984/85 fiscal year at the time of writing.

But the data problems did not end there. Biennial data collection meant we had no data on ultrasound procedures for 1983. The points for 1979, 1980, 1981, 1982 and 1984, for each of GVRHD and the total province, were plotted, a smooth curve drawn, and a 1983 estimate, based on non-linear eye-ball interpolation, obtained for Table 6.

Subject to these data problems, none of which seemed major, we find that current rates of obstetrical ultrasound provision are now (1983) averaging one per pregnancy, up from one for every two pregnancies four years earlier. Growth has been even faster in the regions of the province other than GVRHD, consistent with the expanding capacity elsewhere in the province. It would appear that obstetrical ultrasound is becoming a routine procedure, although it would take considerably more research to determine the per pregnancy distribution of services.

Of course number of births may be an appropriate denominator, if ultrasound is less often a procedure associated with abortion. But in the absence of distributional data by trimester and outcome, one can only speculate. Using births only as a denominator yields a slightly slower rate of growth (14.4% vs. 19.5%) over the longer period (1979-1984).

Ultrasound procedures increased from 36.4 to 71.1 per 1,000 population between 1980 and 1984 (Table 7), for an annual average rate of growth of 18 percent per capita (data for 1979 are incomplete; therefore, for comparison purposes in this segment, only the period 1980 to 1984 is discussed). The GVRHD rate increased somewhat less rapidly than that of the rest of the province, as did the inpatient compared to the outpatient rate.

TABLE 7: RATES OF GROWTH IN THE NUMBER OF ULTRASOUND PROCEDURES PER ACUTE CARE BED AND PER 1,000 POPULATION, 1980<sup>1</sup> TO 1984

	<u>NUMBER</u>		<u>AVERAGE ANNUAL RATE OF GROWTH (%)</u>
	<u>1980</u>	<u>1984</u>	
ULTRASOUND PROCEDURES PER 1,000 POPULATION:	36.4	71.1	18.22
GVRHD <sup>2</sup>	50.5	90.3	15.64
OTHER B.C. <sup>2</sup>	25.8	57.0	21.92
INPATIENTS	10.1	17.5	14.73
OUTPATIENTS	26.3	53.6	19.48
INPATIENT ULTRASOUND PROCEDURES PER ACUTE CARE BED:	2.27	4.57	19.12
GVRHD <sup>2</sup>	3.36	6.23	16.69
OTHER B.C. <sup>2</sup>	1.38	3.25	23.88
INPATIENT ULTRASOUND PROCEDURES PER ACUTE CARE BED, FOR FACILITIES PROVIDING ULTRASOUND:	3.15	5.24	13.57
GVRHD <sup>2</sup>	3.78	6.48	14.42
OTHER B.C. <sup>2</sup>	2.38	4.06	14.28

<sup>1</sup> Data incomplete for 1979

<sup>2</sup> Region is that of the facility providing the service, not necessarily that where the patient resides. Thus, these figures are services provided in each region, to whomever, divided by the population or bed capacity of the region.

Inpatient ultrasound procedures per acute care bed increased from 2.27 to 4.57 in the same period of time, for an average rate of change per

annum of 19 percent. As in the per capita rates, the rate for other B.C. increased more steeply than did that of the GVRHD. However, when the beds for facilities not providing ultrasound are removed from the denominators, the rates of change stabilize at 14 percent for all regions of the province.

#### IV. STAFFING

Table 8 provides information on the number and estimated productivity of diagnostic medical sonographers over the period 1979 to 1984. The number of personnel providing ultrasound services has more than doubled since 1979; 139 individuals provided at least some service during 1984. This includes 103 full-time-equivalent sonographers, again over double the number in 1979. The

TABLE 8: DIAGNOSTIC MEDICAL SONOGRAPHERS IN B.C.  
1979 TO 1984

	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1984</u>
Total Personnel <sup>1</sup> Providing Service	62	79	91	103	139
Estimated Full-Time Equivalent (FTE) Sonographers <sup>2</sup>	46.1	58.6	67.8	77.8	103.3
Estimated FTE Sonographers: per FTE Ultrasound Room	1.3	1.3	1.3	1.2	1.2
Procedures per FTE Sonographer	1507	1669	1777	2044	1970

<sup>1</sup> Including full-time and part-time ultrasonographers, students, radiology technicians and radiographers providing sonographic services. Information on others providing the service (radiology technicians, radiographers, etc.) not requested in 1979.

<sup>2</sup> For calculation of FTE's, for facilities opening or closing rooms, estimates of full-time-equivalents take into account the number of months the rooms were open. The figures include student sonographers being trained on the job and BCIT students. The BCIT program commenced in 1980 with 8 students (5.9 FTE's), increasing to 10 (7.3 FTE's) in 1984.

rate of growth of f.t.e. sonographers has stayed even with that of personnel with any involvement, the persons/f.t.e. sonographers ratio remaining at about 1.34 throughout 1979 to 1984. Eighty-five full-time and 22 part-time ultrasonographers, 17 students (7 on-the-job and 10 BCIT), nine radiology technicians and six radiologists provided ultrasound services in 1984.

The BCIT program commenced in 1980 with eight students, increasing to ten in 1983. Students spend two days a week for four months, then four and one half days a week for eight months, at seven participating hospitals.

The data in Table 8 also suggest that staffing per ultrasound room has remained stable, at 1.2 to 1.3 full-time-equivalent sonographers per room. But the service provision, or productivity, of the average full-time sonographer has apparently increased substantially, and seems to be levelling off at about 2000 procedures per year. Of course one cannot tell from these data whether this reflects a true productivity increase, as sonographers become more familiar with procedures and patient loads increase, or whether it reflects capital equipment enhancements (improving machine rather than human productivity) or changes in the mix of procedures being performed. Figure 4 suggested some changes in the latter, but these data alone do not provide information on possible variations in sonographer time requirements for different procedural sites.

Staffing Problems, Training Programs and Future Staffing Requirements

The responses of 58 respondents are reported in this section (52 facilities with ultrasound plus six for the six of these with two departments providing the service).

There were 18 reports of vacant technician positions sometime during 1984. In five of these the positions could not be filled; in the other 13 the positions could be filled, but with difficulty in eight. Of the latter, three recruited from outside the province and one from Great Britain. One waited for a graduate of BCIT, one changed the union status of the position, one gave up (the radiologist does the scans) and one provided no information.

There were 10 reported on-the-job training programs for ultrasound technicians in 1984, one of three months duration, one of eight months, five of one year, and three of two years.

Forty-six (79%) of the 58 respondents indicated a preference for graduates of a formal-training program.

Six were providing a clinical site for students from the BCIT program, three for one student, one for two students and two for three students, 11 students in all.

Future staffing requirements are displayed in Table 9. Facilities currently providing ultrasound indicated they would require an additional 27.5 f.t.e. ultrasonographers within the next two years; the 10 facilities expecting to start ultrasound by 1986 indicated they would require 9.3 f.t.e.'s, for a total of 36.8 f.t.e. ultrasonographers.



TABLE 9: FUTURE SELF-REPORTED STAFFING REQUIREMENTS, 1984

ADDITIONAL FTE TECHNICIANS TO BE ADDED WITHIN 2 YEARS	BY FACILITIES CURRENTLY PROVIDING ULTRASOUND		BY FACILITIES EXPECTING TO START PROVIDING		TOTAL FTE TECHNICIANS
	<u>Facilities</u>	<u>FTE Technicians</u>	<u>Facilities</u>	<u>FTE Technicians</u>	
0.0	23	-	-	-	-
0.5	17	8.5	5	2.5	11.0
1.0	11	11.0	1	1.0	12.0
1.3	-	-	1	1.3	1.3
1.5	2	3.0	3	4.5	7.5
2.0	1	2.0	-	-	2.0
3.0	1	3.0	-	-	3.0
No Info	3	-	-	-	-
TOTAL	58 <sup>1</sup>	27.5	10	9.3	36.8

<sup>1</sup> 6 of the 52 facilities providing ultrasound had 2 departments providing the service, for a total of 58 employing departments.

#### V. THE PUBLIC/PRIVATE MIX OF ULTRASOUND FACILITIES

Prior to 1982, all diagnostic ultrasound in the province was provided out of public general hospitals. There were three private clinics offering this service in 1984, and one other indicated that it would be doing so within two years. There may be others with intent about which we have no current knowledge. About 2.5 percent of all procedures provided in 1984 were provided by the three private facilities.

#### VI. SUMMARY

This makes the fifth year that the Health Manpower Research Unit has solicited information on diagnostic ultrasound from provider institutions or agencies. The report provides a brief look at five year trends in provision

volume and mix, as well as a focus on 1984/85.

Key findings were as follows:

1) Forty-nine acute care hospitals and three private practices were providing ultrasound services in 1984, up from 22 acute care hospitals in 1979. All facilities with 300 or more acute care beds will likely be providing ultrasound by 1986.

2) The number of rooms and machines in use grew in line with the number of providing facilities, at an average annual growth rate of 19 percent over the five years 1979 to 1984.

3) Between 1979 and 1984, total ultrasound procedures increased at an average annual rate of 24 percent, from 69,487 to 203,521. Non-GVRHD growth has exceeded that of the GVRHD, and outpatient procedure growth has exceeded that for inpatients.

4) In 1984, 75 percent of procedures were performed on outpatients, and 54 percent in GVRHD facilities. One-third of procedures were obstetrical and one-half were abdominal/pelvic.

5) Rates of obstetrical ultrasound provision were in 1983 averaging one per pregnancy, up from one for every two pregnancies in 1979, with the rate of growth being even faster in non-GVRHD regions of the province than in the GVRHD.

6) There were 71 ultrasound procedures per 1000 population and 4.6 inpatient procedures per acute care bed in 1984, representing five year annual average rates of growth of 18 and 19 percent, respectively.

7) The number of personnel providing ultrasound services has more than doubled since 1979, to 139 individuals in 1984 - 85 full-time and 22 part-time ultrasonographers, seven on-the-job and ten BCIT students, nine radiology technicians and six radiologists.

8) It appears that staffing per ultrasound room has remained stable, at 1.2 to 1.3 f.t.e. sonographers per room. Apparent productivity of the average full-time sonographer has increased substantially since 1979, but may have levelled off to about 2000 procedures per year.

9) There were 18 vacant technician positions reported during 1984; five could not be filled, and of those filled, eight facilities reported recruiting difficulties.

10) Facilities currently providing ultrasound indicated they would require an additional 27.5 f.t.e. ultrasonographers by 1986. Ten facilities expecting to start ultrasound by 1986 indicated they would require 9.3 sonographers initially.



## APPENDIX 1

### QUESTIONNAIRE



# ULTRASOUND SERVICES QUESTIONNAIRE

1984

## I. GENERAL INFORMATION

1. Name of Hospital or Group \_\_\_\_\_
2. Name of Respondent \_\_\_\_\_
3. Position of Respondent \_\_\_\_\_ Phone \_\_\_\_\_

## II. ULTRASOUND FACILITIES

4. Does your hospital or group have one or more ultrasound rooms which were in use during all or part of 1984?

YES ☐ NO ☐

If NO, please proceed to Question 12b.

If YES: How many? \_\_\_\_\_

Please indicate changes which occurred in 1984 in the number or departmental location (if hospital-based) of ultrasound rooms:

	<u>Number</u>	<u>Department</u>	<u>Opened in which month during 1984</u>
New Rooms	_____	_____	_____
	_____	_____	_____
Rooms which ceased operations	_____	_____	_____
	_____	_____	_____

5. Please indicate the number of each of the following types of machines utilized by your hospital or group as of December 31, 1984, and on order as of that date:

	<u>Number Utilized as of Dec. 31, 1984</u>	<u>Number on Order as of Dec. 31, 1984</u>
(a) Conventional B-scan	_____	_____
(b) Real-time (Linear Array)	_____	_____
(c) Real-time (Sector Format)	_____	_____
(d) M-mode (Dedicated)	_____	_____
(e) M-mode with Sector Scan	_____	_____
(f) Dedicated eye units	_____	_____
(g) Other; Please specify: _____	_____	_____

(....continued)

### III. ULTRASOUND UTILIZATION

6. (a) Please indicate the number of procedures undertaken during the 1984 calendar year or during the 1984-85 fiscal year\* in each of the following areas:

	<u>Inpatient</u>	<u>Outpatient</u>
(i) Obstetrical	_____	_____
(ii) Abdominal and pelvic	_____	_____
(iii) Eye	_____	_____
(iv) Cardiac	_____	_____
(v) Doppler	_____	_____
(vi) Other (Please specify) _____	_____	_____
<b>TOTAL</b>	_____	_____

\*Please check one: Data are for: Calendar Year 1984  
 : Fiscal Year 1984-85 (April 1/84 - March 31/85)  
 : Other (Please specify) \_\_\_\_\_

☐  
☐  
☐

### IV. CURRENT STAFFING FOR ULTRASOUND

7. Please indicate the number of physicians, on average, who worked (part-time or full-time) in your ultrasound room(s) during 1984:

	<u>Number</u>	<u>Average % of their working time spent in Ultrasound*</u>
Radiologists	_____	_____
Cardiologists	_____	_____
Obstetricians	_____	_____
Other (Please specify) _____	_____	_____

\* Total time spent in ultrasound by all physicians in each category (e.g. Radiologists) divided by total working time of the same physicians.

8. How many of each of the following types of personnel were providing 'ultrasound technician' services in your hospital or group as of December 31, 1984.

	<u>Number of Full-time</u>	<u>Number of Part-time</u>	<u>Average % of time spent in Ultrasound by part-time technicians*</u>
Ultrasound technicians	_____	_____	_____
Student technicians**	_____	_____	_____
Other (Please Specify) _____	_____	_____	_____

\* Time spent in ultrasound divided by total working time.

\*\* Currently being trained as diagnostic medical sonographers, formally or on-the-job.

(....continued)



IV. CURRENT STAFFING FOR ULTRASOUND (continued)

9. (a) Did you have vacant technician positions associated with your ultrasound facilities during 1984?

YES ☐ NO ☐

- (b) If YES, were you able to fill these vacancies? YES ☐ NO ☐

- (c) If YES, in (b), did you have any difficulty recruiting experienced ultrasound technicians to fill these vacancies?

YES ☐ NO ☐

- (d) If YES, in (c), how did you resolve this difficulty?

\_\_\_\_\_  
\_\_\_\_\_

10. (a) If you are training your own ultrasound technicians 'on-the-job', what is the duration of their training period? \_\_\_\_\_

- (b) Would you prefer recruiting graduates of a formal ultrasound technician program?

YES ☐ NO ☐

11. (a) Are you providing a clinical site for students from the BCIT ultrasound technician program?

YES ☐ NO ☐

- (b) If YES, for how many students? \_\_\_\_\_

V. FUTURE STAFFING REQUIREMENTS FOR ULTRASOUND

12. Please answer either (a) or (b).

- (a) If YOUR HOSPITAL OR GROUP CURRENTLY HAS ONE OR MORE ULTRASOUND ROOMS: How many technicians do you foresee a need to add (or subtract) to your ultrasound room(s) staff within the next TWO years? (count part-time technicians as  $\frac{1}{2}$ , do not include replacement staff; and indicate 'add' by '+', 'subtract' by '-', e.g. + 2.5). \_\_\_\_\_ or

- (b) IF YOUR HOSPITAL PLANS TO START ITS FIRST ULTRASOUND ROOM WITHIN THE NEXT TWO YEARS: How many technicians do you anticipate needing to adequately staff the room? (count part-time technicians as  $\frac{1}{2}$ ). \_\_\_\_\_

VI. COMMENTS

13. If you have any further comments regarding ultrasound service provision or ultrasound technician staffing, please let us know. We would be particularly interested in hearing of relative strengths of technicians coming from different training backgrounds, staffing problems you may be encountering in ultrasound, etc. (please use additional pages as necessary).

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(....continued)



## APPENDIX 2

MAP OF B.C.



# Regional Hospital Districts

of

## British Columbia

### Regional Hospital Districts

- 1 Alberni-Clayoquot
- 2 Bulkley-Nechako
- 3 Capital
- 4 Cariboo
- 5 Central Coast
- 6 Central Fraser Valley
- 7 Central Kootenay
- 8 Central Okanagan
- 9 Columbia-Shuswap
- 10 Comox-Strathcona
- 11 Cowichan Valley
- 12 Deedney-Alouette
- 13 East Kootenay
- 14 Fraser-Chiem
- 15 Fraser-Fort George
- 16 Greater Vancouver
- 17 Kitimat-Stikine
- 18 Kootenay Boundary
- 19 Mount Haddington
- 20 Nanaimo
- 21 North Okanagan
- 22 Okanagan-Similkameen
- 23 Peace River-Liard
- 24 Powell River
- 25 Skeena-Queen Charlotte
- 26 Squamish-Lillooet
- 27 Stikine
- 28 Sunshine Coast
- 29 Thompson-Nicola

### NRW HEALTH REGIONS\*

- 1 GVRD
- 2 CAPITAL
- 3 FRASER VALLEY
- 4 OKANAGAN
- 5 SOUTH-EAST
- 6 ISLAND COAST
- 7 CENTRAL
- 8 NORTH CENTRAL
- 9 NORTH

\* Regional Hospital Districts have been arbitrarily grouped by the Health Manpower Research Unit in order to provide sufficient base for analysis of smaller manpower groups.

