



**NEPHROLOGY PROGRAM  
DEPARTMENT POLICIES AND PROCEDURES**

**Hypertension - Section 04 - Clinical Practice - HTN Neph 4-03  
Ambulatory Blood Pressure Monitoring (ABPM)  
No.: 01585 (TOH Standardized Policy Number)**

---

**ISSUED BY:**

Spacelabs ©/HTN Primer/HTN Canada

**DATE OF APPROVAL:**

2013/08

**APPROVED BY:**

Hypertension Medical Director  
Program Clinical Director and Division  
Head

**LAST REVIEW/REVISION DATE:**

2016/02

**CATEGORY:**

Clinical Practice

**IMPLEMENTATION DATE:**

2013/08

---

**POLICY STATEMENT:**

- The following policy outlines the process and standards for initiating Ambulatory Blood Pressure Monitoring (ABPM) for patients of the Nephrology Program. ABPM is a noninvasive, fully automated, programmable device that uses oscillometric methodology to measure blood pressure (BP). The ABPM system measures blood pressure at predetermined intervals over a 24 - 48 hour period. This method allows The Health Care Professional to assess overall BP load, BP variability, and diurnal pattern of blood pressure. Readings from 24-hr ABPM are superior in predicting overall cardiovascular outcomes when compared to office blood pressure readings

**DEFINITION(S):**

- ABPM provides BP measurements in a client's own environment during their regular daily activities and sleep periods, which is superior when compared to office BP in predicting future cardiovascular risk

Ambulatory BP Monitoring is warranted to:

- Diagnose hypertension
- Assess 'White Coat' effect/component
- Rule out 'Masked Hypertension'
- Detect unusual BP variability
- Assess patients with apparent drug resistance, hypotensive symptoms with antihypertensive medications, episodic hypertension, and autonomic dysfunction
- Evaluate nocturnal BP (dipper/nondipper/extreme dipper)
- Determine the efficacy of drug treatment over a 24 hour period
- Diagnosis and treatment of hypertension in pregnancy
- Evaluation of symptomatic hypertension

**ALERTS:** N/A

**PROCEDURE:**

Nurse:

- Assemble equipment:
  - Spacelabs© Ambulatory Blood Pressure Monitor
  - Cuff (Sizes: Child, Small, Regular, Large, & Extra Large)
  - Belt, harness, pouch
  - Tape measure
  - Patient diary
  - Patient instruction booklet
  - Stethoscope
  - Mercury sphygmomanometer with appropriate size cuff
  - Borrowing slip
  - Payment form (if applicable)
- Replace batteries after every 44/48 hours of use – 4 “AA” for Model # 90207-12

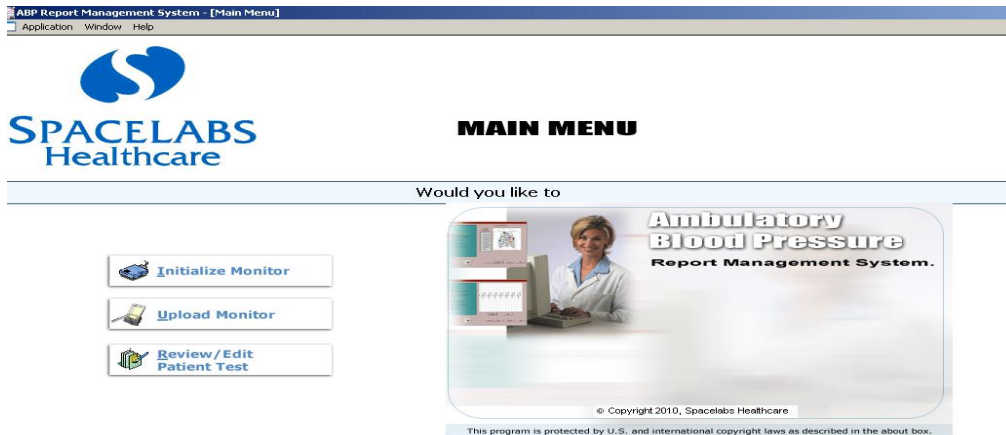
Monitor Initialization:

- Open Spacelabs Healthcare Welcome page and enter your user ID Login/Password
- Connect monitor interface cable to USB port on desktop computer
- Connect the ABP monitor to the ABP Report Management System using the monitor interface cable
- Monitor interface cable “arrow” should be face up pointing towards Spacelabs Logo when attaching to monitor
- Turn monitor on (switch on bottom)
- Login



## Entering Patient Information:

- Monitor Initialization Wizard opens when you click Initialize Monitor on the Main Menu



- Enter the appropriate information in each text box under **Patient Demographic Information**. (Press TAB to move from field to field.)
- “Patient ID” refers to The Ottawa Hospital MRN
- Select the name of the physician from the **Physician** list box. **Choose Dr. Ruzicka**
- **Reason for Test Indications** include ordering Physicians’ name, along with any pertinent information on why the test is being performed. (ex. R/O White Coat Component)
- New/Edit option allows for additional information to be stored
- “Down arrow” provides access to additional information that has been added
- Choose **Data Recorder Serial Number** from drop down list
- After completing the patient demographic information in the **Monitor Initialization Wizard**, click **Next** to select various settings for the ABP monitor

**Monitor Initialization Wizard** — Monitor Initialization

Initialization Name: **Standard**

Show results of reading  
 Clinical verification setup  
 Display Cuff Pressure

Monitor clock display time in:  
 12-hour     24-hour

Wake periods			
	Start Hour	Readings / Hour	Tone:
1	6	2	<input checked="" type="checkbox"/>
2			<input type="checkbox"/>
3			<input type="checkbox"/>

Sleep periods			
	Start Hour	Readings / Hour	Tone:
1	22	1	<input type="checkbox"/>
2			<input type="checkbox"/>
3			<input type="checkbox"/>

< Back    Next >    Cancel    Help

- **Initialization Name** list box — Select from a list of preconfigured initialization settings. **Choose Standard**
- Monitor display settings — Select ABP monitor settings. **Choose 24 hour**
- Period settings and pie chart — Make adjustments to wake and sleep periods as desired. **Standard is every 30 minutes during the day and every hour overnight**
- The pie chart reflects the total wake time and total sleep time settings
- Select Tone (On Wake periods/Off Sleep periods)
- Select “Next”

**Monitor Initialization Wizard** — Initialize Monitor

Initialize Monitor

Select Communication Mode:

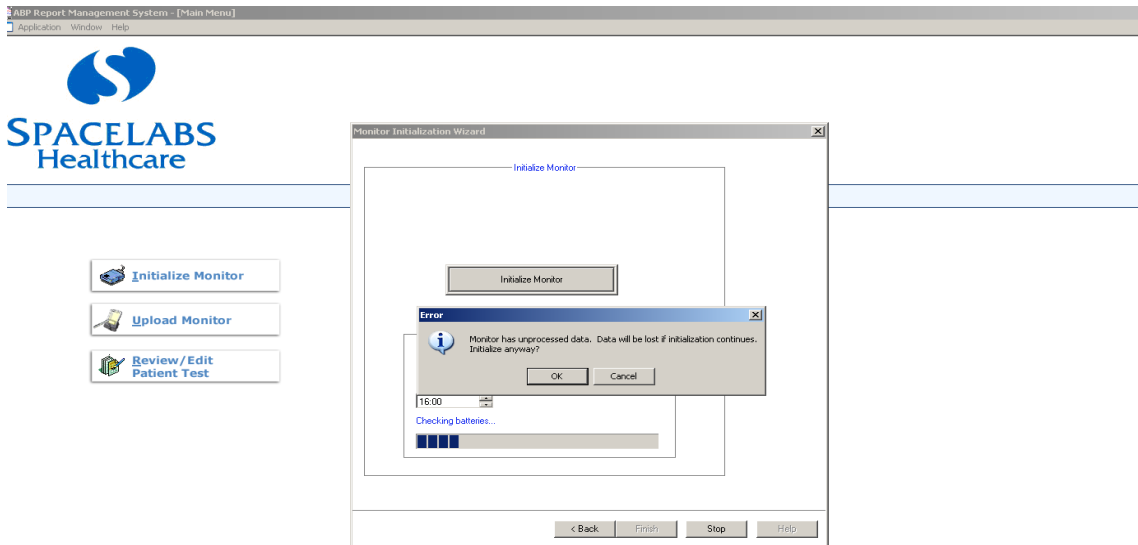
Direct     Select Com Port  
 Modem    COM1

16:22

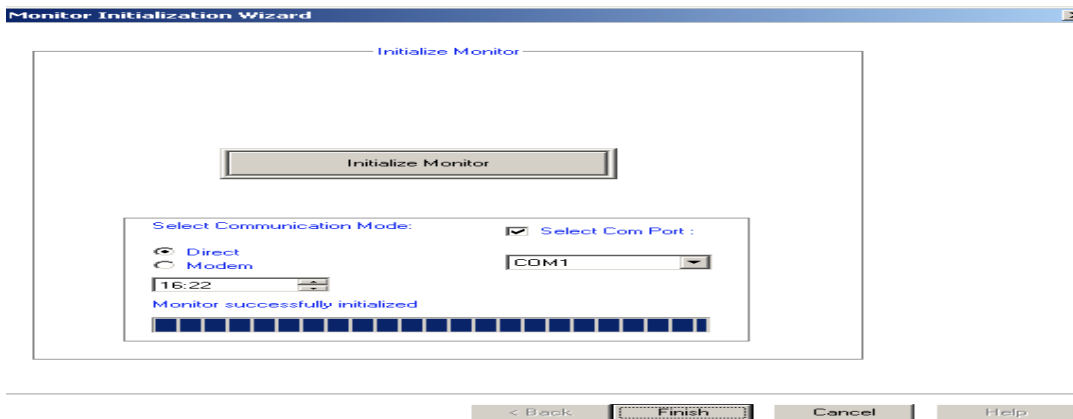
< Back    Finish    Cancel    Help

## Monitor Initialization:

- Ensure monitor is “ON” prior to initializing
- Select Communication Mode “**Direct**”
- Select Com Port (USB3 @ Civic Campus) (COM 1 @ Riverside Campus)
- Choose “Initialize Monitor”
- The ABP monitor is now ready to record patient information. Refer to the ABP monitor’s operating instructions for further instructions on attaching the cuff to the patient



- **Note:** When the display shows “**Monitor has Unprocessed Data, do you want to Continue**” **CANCEL** initializing process and upload data to ensure that the previous patients data is not lost
- **Otherwise** go ahead and “Initialize Monitor”



- Click “**Finish**” and turn monitor off
- Record monitor and cuff # used on patient log
- **Note:** – ensure ABPM is uploaded after a daylight savings time change for individual patients. If initialized before the time change and placed on the patient after the time change all times will be inaccurate by that hour

Patient Assessment:

1. Take height and weight of patient
2. List all current antihypertensive medications (name, dose, frequency, recent changes; adherence) on ‘ABPM Patient Record’
3. Ask patient if he has worn an ABP monitor before (assess learning needs):
  - Explain procedure to patient
  - Patient should be seated with back well supported
  - Patient’s feet should be flat on floor; legs uncrossed
  - Measure arm circumference at midpoint between the olecranon and acromion processes (between shoulder and elbow bones) – advise patient of measurement and their appropriate cuff size
  - Support arm on table with midpoint of the cuff at heart level
  - Select appropriate manual cuff – bladder should encircle at least 40% of the limb circumference and bladder length should encircle at least 80% of the limb circumference
4. Measure blood pressure in both arms using proper auscultatory technique or a validated oscillometric BP monitor (BpTRU)
  - If SBP difference <10mmHg, use non – dominant arm
  - If SBP difference >10mmHg, use arm with greater blood pressure
  - Record Manual BP readings on patient record, indicating (R) and/or (L)
  - Using permanent marker put an ‘X’ on the patient’s arm over the brachial artery pulsation at the anticubital fossa
5. Place Spacelabs cuff on bare arm with the cuff edge 2-3 cm above the elbow crease, “indicator arrow” on cuff pointing at the “X” mark on patients arm
  - Ensure cuff is snug so that you can slide 1-2 fingers under the cuff edge
  - Repeat cuff positioning instructions to patient to ensure they are able to reposition cuff independently
  - Attach cuff tubing to monitor using quick connector
6. Turn Spacelabs monitor on (On/Off Switch is on the bottom of monitor):
  - Instruct patient that this is their control over the entire test
  - If anything untoward occurs with their circulation or sensation, they are to end the test by shutting off the monitor using the On/Off switch
  - Any BP readings taken up to this point will be automatically stored and will not be lost by turning the unit off
  - Remind patient that this is not a painful test
7. To begin the test, measure the initial BP by manually pressing the blue Start/Stop button on the top of the monitor. It is a firm press over the entire blue square - listen for 2 beeps. As soon as you hear the beep you let go of the button.

- **Note:** - automatic readings will not begin until at least one manual measurement has been taken
  - After the two beeps there is a 5 second delay so the patient can stop all activity and straighten their arm. The Spacelabs monitor uses oscillometric technique, which senses the turbulence of the blood flow through the vessel. Movement will cause over inflation of the cuff.
  - Remind the patient that the monitor cannot sense the difference between blood flow and movement so it is imperative that the patient keeps their arm straight and still during the measurement.
- 8.** The cuff automatically inflates to 180mmHg, and then by increments 20-30 mmHg, to determine the SBP. It then automatically deflates and a single tone is heard to notify the patient that the reading is complete.
- If an “error “has occurred a series of 5 beeps is heard and the monitor will
  - automatically retry in one minute (see complete list of errors in patient handout)
  - BP and Pulse are shown in LCD display “window”
  - Record the initial BP reading on ‘ABPM Patient Record’
- 9.** Only the first 5 BP readings are visible in the “display window” on the top of the monitor
- Advise your patient that this is done so that they do not go home and simply concentrate on the BP readings
  - It is very important that they go about their regular daily activities and try to forget about the monitor as much as possible
  - Additional manual readings can be taken by the patient for any hypertension related symptoms (i.e. dizzy, lightheaded, headache etc)
  - Instruct the patient how to initiate a single BP measurement by using the ‘Stop/Start’ button. An “extra” BPM does not change the regular program
  - Instruct the patient that any single reading can be stopped by pressing the ‘Stop/Start’ button in the same fashion (i.e. If the cuff is out of position, discomfort etc.)
- 10.** Explain to patient how to wear the monitor – attach to belt or wear around their neck like an over the shoulder purse
- Go through instruction booklet: diary, error codes and troubleshooting with patient
  - Instruct patient to record activities on diary provided:
    - the time of sleeping and of awakening
    - the time patient takes an extra reading and the rationale for the extra reading
    - the time and description of activities during monitoring
  - How to change their clothes during monitoring
  - That the monitor and cuff should not get wet (will damage the equipment)
  - Remind the patient to discontinue the ABPM if there is discomfort or a change in circulation or sensation in the arm or hand-the monitor should be turned “Off” (bottom of monitor) and the cuff removed if this occurs
  - Remember that the patient’s comfort and ability to perform their usual activities can significantly impact the relevance of monitoring data

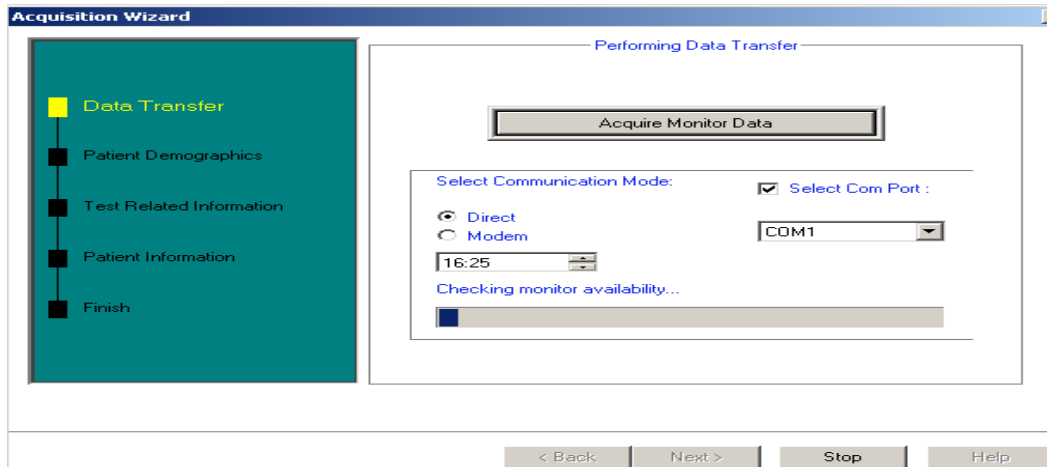
- Instruct patient how to remove and inactivate monitor after 24/44/48 hours - This is usually done when the patient returns the monitor to the HTN Clinic or Hemo Unit
  - o Instruct patient where to return the monitor
  - o Patient should sign consent re: understanding instructions about ABPM
  - o Patient should be given payment form (when applicable)

Acquiring Patient Data:

- Upon completion of the ABPM, you must upload the data to your workstation for analysis, along with the information provided in the patient's activity record



- Open Spacelabs program
- Connect interface cable to monitor and turn on
- Click “Upload Monitor”
- If monitor is “off” you will get a “monitor unavailable” message



- The Acquisition Wizard starts with the Data Transfer process
- Select Direct Communication Mode
- Select correct Com Port (USB3 @ Civic Campus) (COM 1 @ Riverside Campus)

- Click Acquire Monitor Data to upload the patient data to the ABP Report Management System. The ABP Report Management System provides status messages area beneath the Acquire Monitor Data button
- Once the data transfer is complete (indicated by a fully shaded progress bar), click “Next”. The Enter Patient Demographic Information dialog box appears

Entering Patient Demographic Information:

- Verify patient demographics are correct
- **Medications:** Choose “New/Edit”. Input all Antihypertensives, including drug name, dose, time and for Annotation select “yes” so that the medications print on the graphs
- **Indications:** include referring physician and reason for ABPM testing
- Select “next”



ABP Report Management System - [Milobar,Michael A]

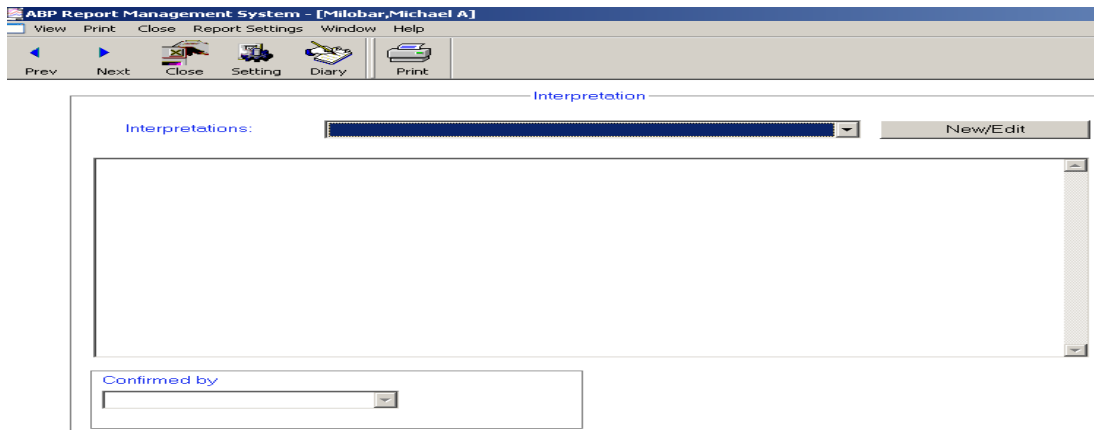
Overall Summary						
	AVG	STD	MIN	MAX	Dipping	
Systolic:	137	14.06 mmHg	99	(01:05 Thu)	161	22.6 %
Diastolic:	88	11.78 mmHg	57	(00:05 Thu)	102	30.2 %
MAP:	105	12.99 mmHg	70		125	26.7 %
Pulse Pressure:	49	6.31 mmHg	37		62	
Heart Rate:	61	5.84 bpm	43		73	
Percent of Systolic above limits:				Reading(s)	Time	
Percent of Diastolic above limits:				69.0%	58.2%	
				73.8%	64.6%	
Wake Period(s) 06:00 - 23:00						
Systolic:	142	7.06 mmHg	128	(06:05 Thu)	161	(08:35 Thu)
Diastolic:	93	5.08 mmHg	82	(11:05 Thu)	102	(08:35 Thu)
MAP:	109	7.04 mmHg	92		125	
Pulse Pressure:	49	6.34 mmHg	37		62	
Heart Rate:	62	5.80 bpm	43		73	
Percent of Systolic readings >	135 mmHg:			Reading(s)	Time	
Percent of Diastolic readings >	85 mmHg:			82.9%	80.2%	
				85.7%	83.0%	
Sleep Period(s) 23:00 - 06:00						
Systolic:	110	7.57 mmHg	99	(01:05 Thu)	117	(02:05 Thu)
Diastolic:	65	5.86 mmHg	57	(00:05 Thu)	73	(05:05 Thu)
MAP:	80	7.35 mmHg	70		89	
Pulse Pressure:	45	5.30 mmHg	39		53	
Heart Rate:	57	4.54 bpm	51		62	
Percent of Systolic readings >	120 mmHg:			Reading(s)	Time	
Percent of Diastolic readings >	70 mmHg:			0%	0%	
				14.3%	8.3%	

This is a controlled document prepared solely for use at The Ottawa Hospital (TOH). TOH accepts no responsibility for use of this material by any person or organization not associated with TOH. No part of this document may be reproduced in any form for publication without permission of TOH. A printed copy may not reflect the current electronic document and should be checked against the one on the TOH Intranet.

- Verify “**Report Settings**” (located in top tool bar) reflect the wake and sleep times as reported by patient in “Activity Log”
- Overall Summary – Ensure parameters are accurate; Wake period/Sleep period/Targets (24 hour mean = 130/80; Wake = 135/85; Sleep = 120/70)

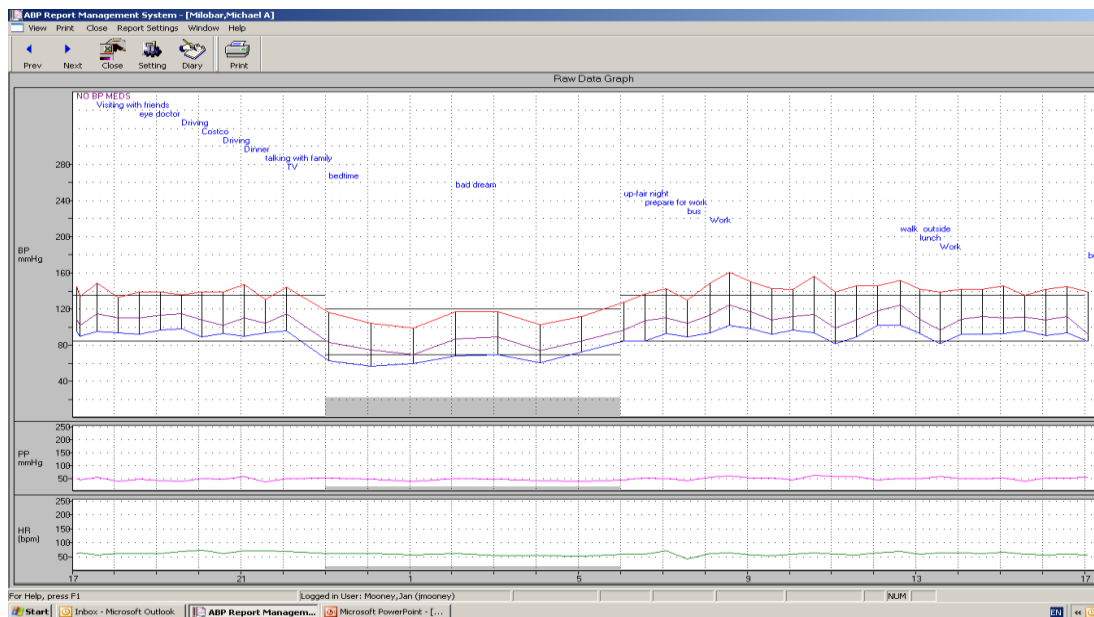
Interpretation:

- Physician reviews and interprets test (Currently done manually by physician)
- Nurse can add to this field as required prior to MD interpretation. Typically nurse would input unusual events here



The **Raw Data Graph** displays raw data from ABP readings in a graphical format

- The BP (top) graph displays the systole (the upper value), MAP (the middle value), and diastole (the lower value)
- The PP (middle) graph displays pulse pressure
- The HR (bottom) graph displays heart rate
- The statistical sleep period is the horizontal gray bar at the bottom of the BP graph
- The statistical settings thresholds are the black horizontal line(s) in the BP graph



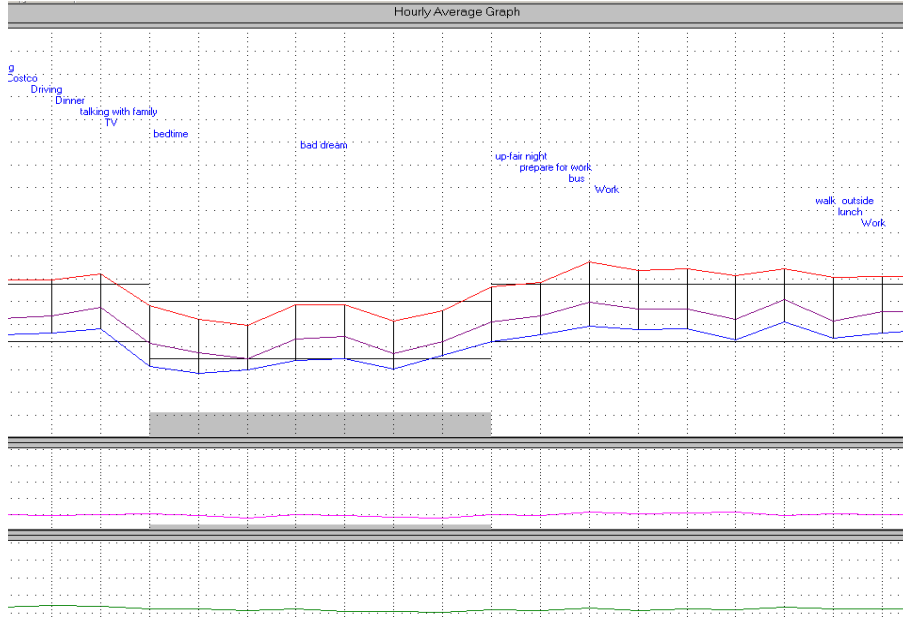
- The **ABP Raw Data Tabular** page displays raw data from ABP readings in a tabular format. Each reading is a row in the table. The reading numbers appear at the left side of the table. The various components of the reading appear at the top of the columns. Use the vertical scroll bars to scroll through the readings
- The ABP Report Management System records the edit status of each reading and displays this information in the Edit Status column
  - **EE** signifies an event edit, which comes from the ABP monitor
  - **AE** signifies an automatic edit, which has configurable limits set on the **Statistics** tab of the **System Settings** dialog box
  - **ME** signifies a manual edit, which the operator initiates
- You can edit a cell in the **Edit Status** column if the cell does not already contain an **EE** or an **AE** status

#		Time	Systolic	Diastolic	MAP	PP	HR	Event Code	Edit Status	Diary Activity
1	M	17:06 Wed	145	95	109	50	62			
2	M	17:11	134	90	102	44	65			
3		17:35	149	95	115	54	58			Visiting with friends
4		18:05	133	94	110	39	61			
5		18:35	139	92	110	47	61			eye doctor
6		19:05	139	97	113	42	63			
7		19:35	136	98	115	38	68			Driving
8		20:05	139	89	108	50	73			Costco
9		20:35	139	93	102	46	61			Driving
10		21:05	147	90	110	57	71			Dinner
11		21:35	131	94	104	37	71			talking with family
12		22:05	144	96	115	48	68			TV
13		23:05	116	63	83	53	62			bedtime
14		00:05 Thu	104	57	75	47	62			
15		01:05	99	60	70	39	56			
16		02:05	117	68	87	49	62			bad dream
17		03:05	117	70	89	47	54			
18		04:05	103	61	74	42	55			
19		05:05	112	73	85	39	51			
20		06:05	128	85	97	43	59			up-fair night
21		06:35	137	85	107	52	59			prepare for work
22		07:05	143	93	110	50	72			
23		07:35	130	89	104	41	43			bus
24		08:05						11	EE	
25	R	08:07	149	94	113	55	63			Work
26		08:35	161	102	125	59	65			
27		09:05	150	98	117	52	56			
28		09:35	143	92	108	51	55			
29		10:05	142	97	112	45	59			
30		10:35	156	94	114	62	64			
31		11:05	139	82	99	57	59			
32		11:35	146	89	108	57	58			
33		12:05	146	102	118	44	65			
34		12:35						70	EE	
35	R	12:38	152	102	125	50	68			walk outside
36		13:05	142	93	109	49	59			lunch
37		13:35	139	82	97	57	65			Work

R = Auto Retry      EE = Event Edit      AE = Auto Edit  
M = Manual Initiated      ME = Manual Edit      <> = Estimated  
Note: To see the Event Code description, move your mouse over the Event Code numeric value.

- Click the desired cell and select a diary activity item from the list
- OR-
- Type the diary activity into the selected cell

**Hourly Average Graph – do not need to print in final report**



**Caliper Summary – do not need to print in final report**

The screenshot shows the "ABP Report Management System - [Milobar, Michael A]" window. The menu bar includes "View", "Print", "Close", "Report Settings", "Window", and "Help". The toolbar contains icons for "Prev", "Next", "Close", "Setting", "Diary", and "Print". The main area is titled "Caliper Summary View" and contains a table with the following columns: "Time", "Reading", "Systolic", "Diastolic", "MAP", "PP", "HR", and "Comments". The table is currently empty. Below the table are three buttons: "Insert", "Edit", and "Delete".



- Initialize Monitor
- Upload Monitor
- Review/Edit Patient Test

The screenshot shows the "System Settings" dialog box with the following sections:

- Report Format:**
  - Use Standard Report
  - Use Custom Report
- Page to Print:**
  - Tabular Hourly Average
  - Raw Data Graph
  - Discrete Raw Data Graph
  - Hourly Average Graph
  - Discrete Hourly Average Graph
- Facility Identification:**
  - RENAL HYPERTENSION CLINIC
  - 24 HOUR AMBULATORY BLOOD PRESSURE MONITORING
- Enable Icon Selection:**
  - Enable Icon Selection
  - Browse:
- Tabular Time Format:**
  - Even Hours [ 10:00, 11:00, ... ]
  - Incremental Hours [ 1, 2, 3, 4, ... ]
  - Relative Hours [ 9:31, 10:31, ... ]

Buttons: "Clear All", "Select All", "Standard", "Advanced", "OK", "Cancel".

This is a controlled document prepared solely for use at The Ottawa Hospital (TOH). TOH accepts no responsibility for use of this material by any person or organization not associated with TOH. No part of this document may be reproduced in any form for publication without permission of TOH. A printed copy may not reflect the current electronic document and should be checked against the one on the TOH Intranet.

### Save Data:

- Choose – “Custom Report” and include Cover page, Tabular Raw Data, Edit Summary, & Raw Data Graph
- Click on “Enable Icon Selection for TOH icon
- Tabular Time Format should be on “Even Hours”
- Print Options/Click “OK”
- Print Report – click on icon or “print” in toolbar for printing options
- Close program by using icon **Note: DO NOT USE “X”** in top right corner of computer screen or data will be lost



### Documentation:

- Record Manual BP readings on patient record, indicating (R) and/or (L)
- Record ABPM monitor and cuff # used on patient log
- Record at least 2 ABPM readings on ‘ABPM Patient Record’
- Ensure that manual readings are <10mmHg different than ABPM readings

**DOCUMENTATION:** N/A

**RELATED POLICIES / LEGISLATION:** N/A

### **REFERENCES:**

1. European Society of hypertension recommendations for conventional, ambulatory and home blood pressure. Journal of hypertension 2003, 21:821 – 648
2. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. 2560 Jama, May21,2003 – Vol289, No 19
3. American Heart Association. Hypertension Primer. Third Edition Izzo and Black
4. Hypertension Therapeutic Guide – Hypertension Canada
5. Spacelabs© ABP Management System. **Ambulatory Blood Pressure Report Management System 92506-1/N Operations Manual Software versions 3 and higher**

**COMMENTS / SIGNIFICANT REVISIONS:** N/A