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The RICH LIFE Project: Blood Pressure Training Certification Checklists

*Reducing Inequities in Care of Hypertension:
Lifestyle Improvement for Everyone*

PRINCIPAL INVESTIGATORS:
LISA A. COOPER, MD, MPH
JILL MARSTELLER, PHD, MPP

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Checklists for Certifying Clinical Staff

A. Instructor Checklist for Operating Omron HEM-907XL Device

The Omron HEM-907XL

State to examinee: *Let's go over the Omron device. Show me how the cuffs connect to the device.*

Item	Satisfactory	Unsatisfactory
A1. Describes how to connect the tubing to the Omron device and cuffs.		

State to examinee: *Okay, can you tell me what each of the buttons and dials do?*

Item	Satisfactory	Unsatisfactory
A2. Describes what the ON/OFF button does.		
A3. Describes what the START button does.		
A4. Describes what the DEFLATE/1 st /2 nd /3 rd /AVG button does.		
A5. Describes what the STOP button does.		
A6. Describes what the Hide button.		
A7. Describes what the P-set dial does.		
A8. Describes what the Mode dial does.		
A9. Describes how to identify and address error codes.		

B. Instructor Checklist for Performing Automated BP measurements

Automated Screening Measurements

State to examinee: *Okay, let’s pretend that [volunteer] is a patient who has arrived for a clinic visit. Walk through the steps you would take to measure [his/her] blood pressure.*

Item	Satisfactory	Unsatisfactory
B1. Explains procedure to patient and/or family member.		
B2. Positions patient in chair with back supported.		
B3. Positions patient with arms relaxed and uncrossed.		
B4. Positions patient with legs uncrossed.		
B5. Positions patient with feet supported.		
B6. Selects appropriate cuff size.		
B7. Wraps cuff around bare arm.		
B8. Wraps cuff around arm in correct position.		
B9. Supports patient’s arm at heart level.		
B10. Obtains a <i>screening</i> BP reading from the Omron device.		
B11. Records screening value in EMR in the first BP slot and labels it as “screening”.		

Automated Confirmatory Measurements

State to examinee: *Okay, let’s pretend that the blood pressure reading was 126/72 mmHg. What do you do? What if the blood pressure were 154/96 mmHg. What would you do now?*

Item	Satisfactory	Unsatisfactory
B12. Demonstrates understanding of the Screen and Confirm process.		
B13. Asks patient to empty his/her bladder.		
B14. Explains the confirmatory BP measurement process to patient.		
B15. Prepares the patient for confirmatory BP measurement		
B16. Obtains a <i>confirmatory</i> BP reading from the Omron device.		
B17. Records confirmatory reading in the EMR in a second BP slot and labels it as “confirmatory”. Does NOT replace screening BP.		

C. Instructor Checklist for performing Manual BP measurements

Manual Screening Measurements

State to examinee: *Okay, let's pretend that [volunteer] is a patient who has arrived for a clinic visit. In what situations would you have to measure his/her blood pressure manually?*

Item	Satisfactory	Unsatisfactory
C1. Demonstrates understanding of when manual BP measurement is required.		

State to examinee: *Okay, show me how you would take [his/her] blood pressure manually.*

Item	Satisfactory	Unsatisfactory
C2. Explains procedure to patient and/or family member.		
C3. Positions patient in chair with back support.		
C4. Positions patient with arms relaxed and uncrossed.		
C5. Positions patient with legs uncrossed.		
C6. Positions patient with feet supported.		
C7. Selects appropriate cuff size.		
C8. Wraps cuff around bare arm.		
C9. Wraps cuff around arm in correct position.		
C10. Supports patient's arm at heart level.		
C11. Palpates radial artery and inflates cuff to identify the <i>minimum inflation level</i> (MIL).		
C12. Places bell of stethoscope over brachial artery.		
C13. Re-inflates cuff to 30 mmHg higher than the MIL.		
C14. Deflates cuff 2-3 mmHg per second (or slower).		
C15. Correctly identifies the 1 st Korotkoff sound – when the pulse sounds first appeared.		
C16. Correctly identifies the 5 th Korotkoff sound – when the pulse sounds completely disappeared.		
C17. Continues to auscultate (listen) and slowly deflate cuff for at least 20 mmHg after 5 th Korotkoff sound.		
C18. Records BP value in the EMR in the first BP slot and labels reading as “manual screening”.		

Manual Confirmatory Measurements

State to examinee: *Ok, let's pretend the manual blood pressure was 134/84 mmHg. What do you do? What would you do if the manual blood pressure reading was 148/76 mmHg?*

Item	Satisfactory	Unsatisfactory
C19. Demonstrates understanding of the Screen and Confirm process for manual BP measurement.		

Instructor Guides for Certifying Staff

Objectives: Each practice network will ensure all rooming staff understand:

1. How to operate the Omron HEM-907XL device.
2. How and when to obtain an automated *screening* BP measurement.
3. How and when to obtain a manual *screening* BP measurement.
4. How and when to obtain an automated *confirmatory* BP measurement.
5. How and when to obtain a manual *confirmatory* BP measurement.

A. Instructor Checklist for Operating Omron Device

The probes in each item listed below reinforce learning and enhance understanding. These probes are suggestions, you should use your own additional probing questions as needed.

The Omron Device

State to examinee: *Let's go over the Omron device. Show me how the cuffs connect to the device.*

Item A1	Describes how to connect the tubing to the Omron device and cuffs
What to look for	(1) Does examinee recognize that the S, M, and L cuffs attach to a connector tube <u>by twisting together</u> two plastic joints? (2) Does examinee recognize that they should <u>never pull off</u> the rubber tubing from the plastic joints? (3) Does examinee recognize that the XL cuff connects directly to the Omron device?
Key things to know	(1) There are two tubes: one for the XL cuff and one for the S, M, and L cuff. (2) The S, M, and L cuff connect to a connector tube at the tube joint. Clinic staff should NEVER need to pull the rubber tubing off of a plastic part (this destroys the cuff and will cost the clinic ~\$50-\$100 per cuff). (3) The XL cuff attaches directly to the Omron device. Again, clinic staff should NEVER have to pull the rubber tubing off of a plastic part.
Probes to consider	(1) [If examinee connects one of the S/M/L cuffs] <i>How you would connect an extra-large cuff?</i> [Preferred answer – trainee recognizes that XL cuffs connect directly to the device.] (2) [If examinee connects the XL cuff] <i>How you would connect a medium cuff?</i> [Preferred answer - trainee recognizes that S/M/L cuffs do not connect directly to the device; tubing should be connected <u>by twisting together</u> two plastic joints.] (3) <i>Would you pull the tubing off of the connector to change cuffs?</i> [Preferred answer –No. Trainee should recognize that this could destroy the cuff and require that it be replaced.]

State to examinee: *Okay, can you tell me what each of the buttons and dials do? Walk through each of the buttons described below with examinee.*

Item A2	Describes what the ON/OFF button does
What to look for	(1) Does examinee recognize what the button does?
Key things to know	(1) Button turns device on. (2) Button turns device off.

Item A3	Describes what the START button does
What to look for	(1) Does examinee recognize what the button does?
Key things to know	(1) Button activates the blood pressure measurement process. When device is in SINGLE mode, cuff will begin to inflate immediately. When device is in AVG mode, a timer will begin to count down. (2) When device is in AVG mode, pressing the button a second time will cause to cuff to inflate immediately.
Probes to consider	(1) <i>Look at the Mode dial. How do the different modes (Avg. vs Single) change what happens when you push the START button?</i> [Preferred answer: examinee recognizes that if the device is in SINGLE Mode, the cuff will immediately begin to inflate. And, if the device is in AVG mode, a timer will begin to count down.]

Item A4	Describes what the DEFLATE/1st/2nd/3rd/AVG button does
What to look for	(1) Does examinee recognize what the button does?
Key things to know	(1) Button toggles display between Average, 1 st , 2 nd , and 3 rd pulse and BP readings after blood pressure has been measured in AVG mode. (2) Button can also be used to manually deflate the BP cuff when device is in MANU mode.

Item A5	Describes what the STOP button does
What to look for	(1) Does examinee recognize what the button does?
Key things to know	(1) Button stops the BP measurement process and deflates the cuff when device is in SINGLE, AVG or MANU mode.
Probes to consider	(1) <i>Describe a situation when you may need to push the “Stop” button?</i> [Preferred answer: examinee gives examples like, when measurement should be retaken because patient states that the cuff is causing pain or patient is fidgeting/speaking during the measurement.]

Item A6	Describes what the Hide button does
What to look for	(1) Does examinee recognize what the button does?
Key things to know	(1) Button hides the pulse and BP display. It often is used to hide BP measurement results from patients who may feel anxious about seeing BP results.
Probes to consider	(1) <i>Describe a situation when you may want to hide the BP measurement results.</i> [Preferred answer: when measuring an anxious patient’s BP especially if they have expressed concern about their BP that day or at a prior visit.]

Item A7	Describes what the P-set dial does
What to look for	(1) Does examinee recognize what the dial does?
Key things to know	(1) Dial sets the maximum pressure that cuff will inflate to. (2) When set to AUTO, it will automatically inflate to a pressure determined by the device’s sensor.

Item A8	Describes what the Mode dial does
What to look for	(1) Does examinee recognize what the dial does?
Key things to know	<p>(1) Dial sets different types of BP measurement programs available on the Omron device.</p> <p>(2) When set to SINGLE mode, device will immediately inflate the cuff and obtain one BP measurement.</p> <p>(3) When set to AVG mode, device will start a timer. After the timer counts down 5 minutes, the device will automatically obtain three back-to-back BP measurements.</p> <p>(4) When set to MANU mode, the device will inflate and deflate the BP cuff, but it will not measure the BP. This mode can be used to obtain a manual BP measurement.</p> <p>(5) When set to CHECK mode, the device can be used with a Y-connector that allows it to be calibrated. This mode is not used for clinical purposes.</p>

Item A9	Describes how to identify and address Error codes (see Table 1 for a list of Error Codes)
What to look for	(1) Does examinee know what to do when the device displays an error code?
Key things to know	<p>(1) A table describing what each error code can be found in several places: (a) on a card attached to each device, (b) on p. 27 of the User Manual, (c) on the last page of this document, and (d) online at http://omronhealthcare.com/wp-content/uploads/hem-907xl_im.pdf.</p> <p>(2) Healthcare workers can address many error codes by systematically examining the device and how it is connected to the patient:</p> <p>(a) Look at device and confirm that P-set dial is on AUTO.</p> <p>(b) Check that tubing is connected to the device.</p> <p>(c) Check that tubing is not kinked and does not have leaks.</p> <p>(d) Check that cuff is wrapped around patient’s arm correctly.</p> <p>(e) Check that cuff does not have leaks.</p> <p>(f) Check that patient has not moved during BP measurement.</p>
Probes to consider	<p>(1) <i>Walk me through the steps you would take if you received an “Error 1” code during a BP measurement.</i> [Preferred answer: Error code 1 is an inflation error. The MA should check the tubing is correctly attached to the device, that they are using the correct tubing (the XL cuff has its own tubing), and that there are no holes or kinks in the tubing.]</p> <p>(2) <i>What about Error 9?</i> [Preferred answer: examinee recognizes that Error codes 1-8 indicate issues that clinic staff can usually address by systematically assessing and adjusting the device and/or patient, but Error code 9 indicates that device should be taken offline and sent to Biomedical Engineering.]</p>

B. Instructor Guide for Performing Automated BP Measurements

Automated Screening Measurements

State to examinee: *Okay, let's pretend that [volunteer name] is a patient who has arrived for a clinic visit. Walk through the steps you would take to measure [his/her] blood pressure.*

Item B1	Explains procedure to patient and/or family member
What to look for	(1) Does examinee explain to patient what he/she is doing? (2) Does examinee ask patient to sit quietly and without speaking until the measurement is done?
Why item is important	Accurate BP measurement depends upon patient participation. Patients who talk, fidget or move during BP measurement may have erroneous readings.
Probes to consider	(1) <i>Why is it important to explain the procedure to the patient before beginning the measurement?</i> [Preferred answers: examinee recognizes that the patient's behavior is key to obtaining an accurate reading and that some patients may be apprehensive of the new protocol; therefore telling the patient what they to expect could help put them at ease.]

Item B2	Positions patient in chair
What to look for	(1) Does examinee place patient in a chair or equivalent for BP measurement?
Why item is important	The studies from which treatment thresholds were established used BP measurements obtained from seated patients. Therefore, office-based BP measurements should be performed in seated patients whenever possible.
Probes to consider	(1) <i>Why did you sit the patient in the chair and not on the exam table?</i> [Preferred answer: An exam table doesn't allow for proper patient positioning, the back is unsupported, their feet may dangle, and their arm might not be able to be supported.]

Item B3	Positions patient with back supported
What to look for	(1) Does examinee confirm patient can lean their back against the back of the chair? (2) Does examinee confirm patient is comfortable, while resting against the back of the chair?
Why item is important	Sitting without back support can make BP appear higher than it really is, so patients should be positioned so that their back is resting comfortably against the back of a chair.
Probes to consider	(1) <i>Why did you ask if the patient was comfortable?</i> [Preferred answer: If the patient is physically uncomfortable it may falsely raise their BP.]

Item B4	Positions patient with legs uncrossed
What to look for	(1) Does examinee confirm patient's legs uncrossed? (2) Does examinee make sure patient's legs remain uncrossed until BP measurement is done?
Why item is important	Sitting with legs crossed can make BP appear higher than it really is, so patients should sit with legs uncrossed during BP measurement.
Probes to consider	(1) <i>Describe what you would do if the patient crosses their legs during the measurement?</i> [Preferred answer: If the examinee notices the crossed legs right away they should ask the patient to uncross their legs. If the examinee realizes the patient has had their legs crossed for most of the measurement, the examinee should restart the measurement.]

Item B5	Positions patient with feet supported
What to look for	(1) Does examinee confirm that patient's feet are supported? (2) If patient's feet cannot reach floor, does examinee provide a foot stool or similar support?
Why item is important	Sitting with feet dangling can make BP appear higher than it really is, so patients should be able to rest their feet on the floor, or supported with a comfortable surface, such as a foot stool.
Probes to consider	(1) [If examinee did not demonstrate use of a foot stool or similar support] <i>What if your patient's feet don't reach the floor? How would you handle that?</i> [Preferred answer: Examinee provides patient with a foot support such as a foot stool, stack of books, box, or similar item.]

Item B6	Selects appropriate cuff size
What to look for	(1) Does examinee ensure that the BP cuff matches the circumference of their upper arm?
Why item is important	When BP cuffs are too small, blood pressure can appear higher than it really is; when BP cuffs are too large, blood pressure can appear lower than it really is. Therefore health care workers should use a blood pressure cuff that is appropriate for the patient's upper arm. Guidelines for selecting the appropriate cuff size are in this Table. Often, BP cuffs also have cuff markings to indicate whether a cuff is too large or too small once it is applied to a patient's arm.
Probes to consider	(1) <i>Why did you choose that cuff size? How did you know it was the right size?</i> [Preferred answer: examinee states that he/she used the cuff markings (range) to determine if the cuff size was correct once the cuff was on the patient's arm.]

Item B7	Wraps cuff around bare arm
What to look for	(1) Does the examinee wrap the BP cuff around a bare arm? (2) If patient is wearing long sleeves, does examinee roll up the sleeve before applying the cuff? (3) If examinee rolls up the patient's sleeve, does he or she ensure that the rolled sleeve does not constrict blood flow to the arm? (4) If patient is wearing several layers of clothing, does examinee ask patient to remove the excess layers?
Why item is important	With automated BP measurement, the presence of clothing between the cuff and blood vessels in the patient's arm can interfere with the device's ability to detect pulse waves. (2) With manual BP measurement, the presence of clothing between the cuff and the blood vessels in the patient's arm can muffle pulse sounds and decrease one's ability to accurately identify Korotkoff sounds.
Probes to consider	(1) <i>What are situations when you might have trouble putting the cuff on a patient's arm?</i> [Preferred answers describe situations in which (a) patient wears several layers of clothing, or (b) patient wears tight sleeves that constricts blood flow to arm when rolled up.] <i>What you would do if that happened?</i> [Preferred answer describe (a) asking patients to remove excess clothing (if wearing multiple layers), or (b) rolling up patient's sleeve (only if patient is NOT wearing multiple layers).] (2) <i>What would happen if you tried to measure blood pressure over the clothing?</i> [Potential answers describe (a) getting an error code, or (b) getting falsely low BP reading.]

Item B8	Wraps cuff around arm in correct position
What to look for	(1) Does examinee position the cuff such that the middle of <u>the bladder</u> (indicated on the bladder cover by an “Artery” marking). (2) Does examinee wrap cuff such that no more than two fingers can fit under the cuff?
Why item is important	Incorrect placement cuff placement and/or a cuff that is too loose or too tight can result in falsely elevated or lower BP readings.
Probes to consider	(1) <i>How would you wrap the cuff if your patient had an arm that is tapered so that it is larger near the top but skinny near the elbow?</i> [Preferred answer includes positioning the cuff properly over the upper arm, then tightening the cuff by pulling it at an upward angle to allow the Velcro to get a larger bite (much like forming a funnel with a sheet of paper). The examinee should make sure the cuff is snug enough and that only two fingers fit under the lower edge of the cuff.]

Item B9	Supports patient’s arm at heart level
What to look for	(1) Does examinee ensure that the mid-upper arm is at the same height as the apex of their heart? (2) Does examinee ensure that the upper arm is <u>supported</u> at this level? (i.e., do they rest the arm on a comfortable surface at this level instead of telling patient to hold their arm up?)
Why item is important	(1) When a BP cuff is below heart level, relatively more blood fills the arm’s blood vessels, and blood pressure appears higher than it really is. Similarly, when the BP cuff is above heart level, blood pressure appears lower than it really is. For these reasons, patient’s upper arm should be at the same height as their heart. (2) It is important that patients have their arm passively supported and are NOT actively holding their arms up at heart level. Activating muscles to hold up an arm also makes blood pressure appear higher than it really is.
Probes to consider	(1) <i>What are some ways you could rearrange the exam room to make sure the patient’s arm is supported during the BP measurement?</i> [Preferred answer: examinee gives examples describes moving the chair to a location where there could be arm support such as next to a desk or countertop or even the exam table using the available drawers.]

Item B10	Obtains a <i>screening</i> BP reading from the Omron device
What to look for	(1) Has the examinee ensured that the P-Set dial is set to AUTO mode? (2) Has the examinee activated the device with the MODE dial set to SINGLE mode?
Why item is important	In addition to correctly positioning and preparing patients for BP measurement, clinic staff must also be able to use the Omron device appropriately.
Probes to consider	(1) <i>What settings should you use when you take a <u>screening</u> blood pressure?</i> [Preferred answer: P-set dial set to AUTO, MODE dial set to SINGLE] (2) <i>What would happen if the Omron were not set this way?</i> [Preferred answer: If P-set not on AUTO, it would only inflate the cuff to the pressure that the dial is pointing to; this might lead to the cuff not inflating high enough (and give you an error code), or too inflating too high (and squeeze the patient’s arm too tightly). If MODE dial is set to AVG, the Omron would delay inflating the cuff and get 3 readings – this would be a good measurement, but it would take longer than a SINGLE mode reading.]

Item B11	Records screening value in EMR in the first BP field and labels it as “screening”.
What to look for	(1) Does the examinee record the BP value in the first available field in the EMR? (2) Does the examinee label the reading as a “screening reading?”
Why item is important	Recording BP values in the appropriate field and correctly identifying how the reading was obtained supports provider’s clinical decisions and subsequent quality monitoring.

Automated Confirmatory Measurements

State to examinee: *Okay, let’s pretend that the blood pressure reading was 126/72 mmHg. What do you do? What if the blood pressure were 154/96 mmHg. What would you do now?*

Item B12	Demonstrates understanding of the Screen and Confirm process
What to look for	(1) Does the examinee recognize the situations when a single screening BP reading is appropriate and when multiple confirmatory BP readings are needed?
Why item is important	Preparing patients in accordance with guidelines improves the reliability of BP readings. But patients are at risk for falsely high readings if they have full bladders, have not rested for at least 5 minutes, or have only one blood pressure measurement. Healthcare workers can improve the accuracy of BP readings and decrease the risk that patients will receive inappropriate treatment by performing a <i>confirmatory</i> measurement if the <i>screening</i> (or first) BP reading is 140/90 mmHg or higher. When clinic staff routinely confirm BP whenever they recognize a high BP reading instead of waiting for a provider to order it, they facilitate the clinic’s workflow in addition to supporting better patient care.
Probes to consider	(1) <i>What would you do if the blood pressure had been exactly 140/90?</i> [Preferred answer: examinee recognizes that 140/90 mmHg is considered a high BP and therefore it should be confirmed.] (2) <i>What would you do if the blood pressure were 136/92?</i> [Preferred answer - examinee recognizes that if either the systolic or diastolic reading is high, the patient should have their BP confirmed. For example, if <i>either</i> the systolic BP is ≥ 140 mmHg <i>or</i> the diastolic BP is ≥ 90 mmHg, the examinee should perform a confirmatory measurement.]

Item B13	Asks patient to empty his/her bladder
What to look for	(1) Does the examinee ask the patient if they need to empty their bladder? (2) If the patient responds “yes,” does the examinee allow patient to void their bladder before performing a confirmatory BP measurement?
Why item is important	A full bladder can falsely elevate blood pressure 10-20 mmHg. Thus in situations where we are concerned that the patient’s BP is falsely high (i.e., when the screening BP is 140/90 mmHg or higher), asking the patient to void their bladder can provide a more accurate, and often lower, BP reading.
Probes to consider	(1) <i>How might a full bladder affect the patient’s BP measurement?</i> [Preferred answer: A full bladder could falsely elevate the patient’s BP measurement.]

Item B14	Explains the confirmatory BP measurement process to patient
What to look for	(1) Does examinee explain why he or she is getting another BP measurement? (2) Does examinee describe the timed 5-minute rest period when “it looks like nothing is happening”? (3) Does examinee describe how the device will automatically get 3 readings? (4) Does examinee ask patient to relax silently and not move until all 3 readings are completed?
Why item is important	The confirmatory BP measurement process is longer and requires greater patient involvement than the screening process. Patients who are unaware of what is going on may disrupt confirmatory measurements by becoming anxious, talking or moving (especially during the 5 minute rest period or after the first BP measurement ends). It is important to explain the procedure to patients so that they will sit still and quietly until the entire procedure ends.
Probes to consider	<i>Imagine your patient continues to use his/her phone during the confirmatory measurement. How would you handle this situation?</i> [No specific response is preferred. Instead, consider using this question to engage examinee in brief discussion about how to approach patients who violate protocol, including asking patient if anything necessitates using their phone immediately and accommodating him/her if an urgent issue exists. Also consider explaining that using a phone could produce false BP values and lead to inappropriate treatment. The examinee may offer to put the phone on the exam table or desk (still in sight but out of reach) for the patient until the measurement is complete.]

Item B15	Prepares the patient for confirmatory BP measurement
What to look for	<i>(See items B1 to B9 above.)</i>
Why item is important	<i>(See items B1 to B9 above.)</i>
Probes to consider	<i>(See items B1 to B9 above.)</i>

Item B16	Obtains a <i>confirmatory</i> BP reading from the Omron device
What to look for	(1) Has the examinee ensured that the P-Set dial is set to AUTO mode? (2) Has the examinee activated the device with the MODE dial set to AVG mode?
Why item is important	Examinees should not only understand the difference between screening and confirmatory BP measurements (item B12), they also should be able to perform both procedures.
Probes to consider	<i>What settings should you use when you get a <u>screening</u> blood pressure?</i> [Preferred answer: P-set dial set to AUTO, MODE dial set to SINGLE] <i>What would happen if the Omron were not set this way?</i> [Preferred answers: If P-set not on AUTO, it would only inflate the cuff to the pressure that the dial is pointing to; this might lead to the cuff not inflating high enough (and give you an error code), or to inflating too high (and squeeze the patient’s arm too tightly). If MODE dial is set to AVG, the Omron would delay inflating the cuff and get 3 readings – this would be a good measurement, but it would take longer than a SINGLE mode reading.]

Item B17	Records confirmatory reading in the EMR in a second BP field and labels it as “confirmatory”.
What to look for	(1) Does examinee record the confirmatory BP reading in a second field? (It is important to ensure they do NOT replace the screening BP reading in the first BP field.) (2) Does examinee label the confirmatory BP reading as “confirmatory”?
Why item is important	Recording BP values in the appropriate field and correctly identifying how the reading was obtained supports provider’s clinical decisions and subsequent quality monitoring.

C. Instructor Guide for Performing Manual BP Measurements

Manual Screening Measurements

State to examinee: *Okay, let’s pretend that [volunteer] is a patient who has arrived for a clinic visit. In what situations would you have to take his/her blood pressure manually?*

Item C1	Demonstrates understanding of when manual BP measurement is required
What to look for	(1) Does examinee describe a situation when patient has a large upper arm? (2) Does examinee describe a situation when patient has an irregular heart beat?
Why item is important	A validated automated BP measurement device, such as the Omron, should be used to measure blood pressure whenever possible. However, clinic staff should recognize the situations when they would not be able to use an automated device and would instead have to measure blood pressure manually. These include: (1) An automated device is not available. (This should never occur during the RICH-LIFE study.) (2) The patient’s upper arm is too large for the Omron’s XL cuff (i.e., circumference >50 cm). In this situation, clinic staff may still be able to use a manual thigh cuff, which can accommodate arm circumferences up to 55 cm. (3) The patient has an irregular pulse at the time of blood pressure measurement (i.e., <i>active</i> atrial fibrillation or premature ventricular contractions (PVCs)). Unlike manual BP measurement, which relies on auscultating <u>pulse sounds</u> , automated devices estimate blood pressure from the <u>shape of the pulse waves</u> . Irregular pulses interfere with the automated process.
Probes to consider	(1) <i>If the patient has a large upper arm, is it okay to use the Omron with the cuff on their forearm?</i> [Preferred answer: examinee recognizes that measuring blood pressure with a cuff on the forearm can produce inaccurate readings.] (2) <i>What would you do if your patient has a history of atrial fibrillation but has a regular rhythm at the time of the visit?</i> [Preferred answer: examinee recognizes that having a history of irregular heartbeats does not preclude using an automated device, as long as the patient’s pulse is regular during the measurement.]

State to examinee: *Okay, show me how you would take to measure [his/her] blood pressure manually.*

Item C2	Explains procedure to patient and/or family member
What to look for	(1) Does examinee explain to patient what he/she is doing? (2) Does examinee ask patient to sit quietly and without speaking until the measurement is done?
Why item is important	Accurate BP measurement depends upon patient participation. Patients who talk, fidget or move during BP measurement may have erroneous readings.
Probes to consider	(1) <i>Why is it important to explain the procedure to the patient before beginning the measurement?</i> [Preferred answer: examinee explains that the patient’s behavior is key to obtaining an accurate reading and that some patients may be apprehensive of the new protocol (including the Omron and positioning), therefore additional explanation could help put patient at ease.]

Item C3	Positions patient in chair
What to look for	(1) Does examinee place patient in a chair or equivalent for BP measurement?
Why item is important	The studies from which treatment thresholds were established used BP measurements obtained from seated patients. Therefore, office-based BP measurements should be performed with patients seated whenever possible.
Probes to consider	(1) <i>Why did you sit the patient in the chair and not on the exam table?</i> [Preferred answer: An exam table doesn’t allow for proper patient positioning, the back is unsupported, their feet may dangle, and their arm might not be able to be supported.]

Item C4	Positions patient with back supported
What to look for	(1) Does examinee confirm patient can rest their back against the back of the chair? (2) Does examinee confirm patient is comfortable, while resting against the back of the chair?
Why item is important	Sitting without back support can make BP appear higher than it really is, so patients should be positioned so that their back is resting comfortably against the back of a chair.
Probes to consider	(1) <i>Why did you ask if the patient was comfortable?</i> [Preferred answer: If the patient is physically uncomfortable it may falsely raise their BP.]

Item C5	Positions patient with legs uncrossed
What to look for	(1) Does examinee confirm patient’s legs uncrossed? (2) Does examinee make sure patient’s legs remain uncrossed until BP measurement is done?
Why item is important	Sitting with legs crossed can make BP appear higher than it really is, so patients should sit with legs uncrossed during BP measurement.
Probes to consider	(1) <i>What would you do if your patient crosses their legs during BP measurement?</i> [Preferred answer: if examinee immediately notices the crossed legs they should ask the patient to uncross their legs. If examinee realizes patient has had their legs crossed for most of the measurement, examinee should restart the measurement.]

Item C6	Positions patient with feet supported
What to look for	(1) Does examinee confirm that patient's feet are supported? (2) If patient's feet cannot reach floor, does examinee provide a foot stool or similar support?
Why item is important	Sitting with feet dangling can make BP appear higher than it really is, so patients should be able to rest their feet on the floor, or supported with a comfortable surface, such as a foot stool.
Probes to consider	(1) <i>What would you do if your patient's feet do not reach the floor?</i> [Preferred answer: examinee explains how to support the patient's feet with footstool, box, books or similar items.]

Item C7	Selects appropriate cuff size
What to look for	(1) Does examinee ensure that the BP cuff matches the circumference of their upper arm?
Why item is important	When BP cuffs are too small, blood pressure can appear higher than it really is; when BP cuffs are too large, blood pressure can appear lower than it really is. Therefore health care workers should use a blood pressure cuff that is appropriate for the patient's upper arm. Guidelines for selecting the appropriate cuff size are in this Table.
Probes to consider	(1) <i>Why did you choose that cuff size? How did you know it was the right size?</i> [Preferred answer: examinee states that he/she used the cuff markings (range) to determine if the cuff size was correct once the cuff was on the patient's arm.]

Item C8	Wraps cuff around bare arm
What to look for	(1) Does the examinee wrap the BP cuff around a bare arm? (2) If patient is wearing long sleeves, does examinee roll up the sleeve before applying the cuff? (3) If examinee rolls up the patient's sleeve, does he or she ensure that the rolled sleeve does not constrict blood flow to the arm? (4) If patient is wearing several layers of clothing, does examinee ask patient to remove the excess layers?
Why item is important	(1) With automated BP measurement, the presence of clothing between the cuff and blood vessels in the patient's arm can interfere with the device's ability to detect pulse waves. (2) With manual BP measurement, the presence of clothing between the cuff and the blood vessels in the patient's arm can muffle pulse sounds and decrease one's ability to accurately identify Korotkoff sounds.
Probes to consider	(1) <i>What are situations when you might have trouble putting the cuff on a patient's arm?</i> [Preferred answers: examinee describes situations in which (a) patient wears several layers of clothing, or (b) patient wears tight sleeves that constricts blood flow to arm when rolled up.] <i>What you would do if that happened?</i> [Preferred answer: examinee explains that they would (a) ask patient to remove excess clothing (if wearing multiple layers), or (b) roll up patient's sleeve (only if patient is NOT wearing multiple layers).] (2) <i>What would happen if you tried to measure blood pressure over the clothing?</i> [Potential answers include: examinee describes (a) getting an error code, or (b) getting a falsely low BP reading.]

Item C9	Wraps cuff around arm in correct position
What to look for	(1) Does examinee position the cuff such that the middle of <u>the bladder</u> (indicated on the bladder cover by an “Artery” marking). (2) Does examinee wrap cuff such that they can insert two but not three fingers under the cuff?
Why item is important	(1) Incorrect placement cuff placement and/or a cuff that is too loose or too tight can result in falsely elevated or lower BP readings.
Probes to consider	(1) <i>How would you wrap the cuff if your patient’s arm were tapered (that is, thicker near shoulder but skinny near the elbow)?</i> [Preferred answer: examinee describes how to wrap the cuff like a funnel, so that it is snug at the bottom and no more than two fingers can fit under the lower edge of the cuff.]

Item C10	Supports patient’s arm at heart level
What to look for	(1) Does examinee ensure that the mid-upper arm is at the same height as the apex of their heart? (2) Does examinee ensure that the upper arm is <u>supported</u> at this level? (i.e., do they rest the arm on a comfortable surface at this level instead of telling patient to hold their arm up?)
Why item is important	(1) When a BP cuff is below heart level, relatively more blood fills the arm’s blood vessels, and blood pressure appears higher than it really is. Similarly, when the BP cuff is above heart level, blood pressure appears lower than it really is. For these reasons, patient’s upper arm should be at the same height as their heart. (2) It is important that patients have their arm passively supported and are NOT actively holding their arms up at heart level. Activating muscles to hold up an arm also makes blood pressure appear higher than it really is.
Probes to consider	(1) <i>What are other ways to support the patient’s arm?</i> [Preferred answer: examinee describes strategies such as putting a firm surface on the basket of Omron stand or moving chair to use exam table for arm support. Patients should NEVER be asked to hold up their own arm.]

Item C11	Palpates radial artery and inflates cuff to identify the <i>minimum inflation level (MIL)</i>
What to look for	(1) Before checking blood pressure, does examinee correctly identify the radial pulse and inflate the cuff until the pulse disappears? (2) Does examinee note the pressure where the pulse disappears?
Why item is important	To correctly identify the 1 st Korotkoff sound (i.e., systolic blood pressure), the BP cuff must be inflated to a pressure that is high enough to occlude blood flow through the arm. Clinic staff can identify this point by inflating the cuff until the radial pulse disappears and noting the pressure when this occurs.
Probes to consider	(1) <i>Why are you supposed to check the minimum inflation level?</i> [Potential answer: examinee describes how doing this allows them to get a close approximation of the systolic blood pressure so that they can avoid under-inflating the cuff (which leads to inaccurate BP measurements) or over-inflating it (which can cause the patient pain).]

Item C12	Places bell of stethoscope over brachial artery
What to look for	(1) Does examinee use the bell (small side of head) of the stethoscope? (2) Does examinee listen for the pulse sounds with bell in antecubital fossa over brachial artery?
Why item is important	Pulse sounds are heard best when using the bell (small side) of the stethoscope.
Probes to consider	(1) <i>Why are you supposed to use the bell of the stethoscope?</i> [Preferred answer: examinee explains that the using the bell allows him/her to identify pulse sounds (which are low-frequency sounds) better than the diaphragm.]

Item C13	Re-inflates cuff to 30 mmHg higher than the MIL
What to look for	(1) Does examinee inflate the cuff to 30 mmHg higher than the MIL, identified in item 11?
Why item is important	The 1 st Korotkoff sound occurs at close to the same pressure as the MIL. Inflating the cuff 30 mmHg higher than this level will provide a period of deflation prior to the pulse sounds first appearing. This delay helps clinic staff correctly identify the 1 st Korotkoff sound.
Probes to consider	<i>Why do you need to inflate the cuff to 30 mmHg higher than the MIL?</i> [Preferred answer: examinee explains that the MIL is only an approximation of the systolic BP. Inflating the cuff a little higher than this ensures that he/she will accurately be able identify the 1 st Korotkoff sound when he/she deflates the cuff.]

Item C14	Deflates cuff 2-3 mmHg per second or slower
What to look for	(1) Does examinee deflate the cuff slowly enough so that there is one heart beat for every tic mark that the needle passes?
Why item is important	Systolic and diastolic blood pressures are determined by when the pulse sounds appear and disappear (i.e., 1 st and 5 th Korotkoff sounds). Therefore there should be at least one heart beat for every tic mark that the needle passes on a sphygmomanometer dial. Since tic marks on the dial of a manual sphygmomanometer occur every 2 mmHg, and since most patients have heart rates between 60-90 bpm, clinic staff should deflate the cuff no faster than 2-3 mmHg per second in order to ensure that there is at least one pulse sound for every tic mark. Deflating the cuff faster than this risks overshooting the true position when 1 st and 5 th Korotkoff sounds occur, leading to <i>falsely low systolic</i> and <i>falsely high diastolic</i> BP readings.
Probes to consider	(1) <i>How should you deflate the cuff if the patient has an irregular heart beat?</i> [Preferred answer: examinee recognizes that they may need to deflate the cuff even more slowly in order to ensure that there is one heart beat for every tic mark on the dial.]

Item C15	Correctly identifies the 1st Korotkoff sound
What to look for	(1) Does examinee identify the 1 st Korotkoff sound within 2 mmHg of the examiner?
Why item is important	As the cuff deflates, the pressure where blood is able to flow into the arm again represents the highest pressure during a cardiac cycle. This is the systolic blood pressure.

Item C16	Correctly identifies the 5th Korotkoff sound
What to look for	(1) Does examinee identify the 5 th Korotkoff sound within 2 mmHg of the examiner?
Why item is important	As the cuff deflates, the pressure at which blood flow no longer creates turbulence (turbulence makes a rushing sound) as it passes the cuff represents the lowest pressure during a cardiac cycle. This is the diastolic blood pressure.
Probes to consider	(1) <i>What are the pros/cons of rounding the blood pressure up (or down)?</i> [Potential answer: (Pros) Rounding a BP can make us feel better because the number looks nicer. (Cons) (1) Rounding a BP can lead to the patient receiving the wrong treatment and harming them (2) Rounding a BP up can lead to the patient being unnecessarily prescribed a BP medication (3) Rounding a BP down can lead to the patient NOT receiving treatment when they should have.]

Item C17	Continues to auscultate and slowly deflate cuff for at least 20 mmHg after 5th Korotkoff sound
What to look for	(1) Does examinee continue to auscultate while slowly deflating the BP cuff for at least 20 mmHg after they identify the 5 th Korotkoff sound?
Why item is important	Occasionally, patients may exhibit a phenomenon called the “auscultatory gap,” where the pulse sounds disappear and return between the 1 st and 5 th Korotkoff sounds. If clinic staff do not recognize when this occurs, they may record <i>falsely low systolic</i> and/or <i>falsely high diastolic</i> blood pressure values. Continuing to deflate the BP cuff while listening for the pulse sound to reappear lets clinic staff avoid making this error.
Probes to consider	(1) <i>What would you do if the pulse sounds returned after the first time?</i> [Preferred answer: trainee describes recording diastolic BP as the point where the pulse sounds disappear again.] (2) <i>What would you do if the pulse sounds returned but did not disappear at all?</i> [Preferred answer: trainee explains that they would deflate the cuff completely, raising the patient’s arm above his or her head for 30 seconds, and repeating the BP measurement.]

Item C18	Records BP value in the EMR in the first BP slot and labels reading as “manual screening”.
What to look for	(1) Does examinee record the screening BP reading in a first BP field in the EMR? (2) Does examinee label the confirmatory BP reading as “manual screening”?
Why item is important	Recording BP values in the appropriate field and correctly identifying how the reading was obtained supports provider’s clinical decisions and subsequent quality monitoring.
Probes to consider	<i>Where would you document the BP reading if you performed a confirmatory BP measurement manually?</i> [Preferred answer: examinee describes understanding that ALL confirmatory measurements should be added to a second BP field in the EMR and that it should NOT replace the original BP reading.] <i>After you record a confirmatory reading, are you done?</i> [Preferred answer: examinee recognizes that they also should label manual confirmatory BP readings in the EMR as “manual confirmatory”.]

Manual Confirmatory Measurements

State to examinee: *Let's pretend the blood pressure is 162/92 mmHg. What do you do now?*

Item C19	Demonstrates understanding of the Screen and Confirm process for manual BP measurement
What to look for	(1) Does the examinee recognize the situations when a single screening BP reading is appropriate and when multiple confirmatory BP readings are needed?
Why item is important	Preparing patients in accordance with guidelines improves the reliability of BP readings. Patients are at risk for falsely high readings if they have full bladders, have not rested for at least 5 minutes, or have only one blood pressure measurement. Healthcare workers can improve the accuracy of BP readings and decrease the risk that patients will receive inappropriate treatment by performing a <i>confirmatory</i> measurement if the <i>screening</i> (i.e., first) BP reading is 140/90 mmHg or higher. Clinic staff routinely confirm BP whenever they recognize a high BP reading instead of waiting for a provider to order it, they facilitate the clinic's workflow in addition to supporting better patient care.
Probes to consider	(1) <i>What would you do if the blood pressure had been exactly 140/90?</i> [Preferred answer: the examinee recognizes that 140/90 mmHg is considered a high BP and that they should now perform a confirmatory BP reading.] (2) <i>What would you do if the blood pressure was 136/92?</i> [Preferred answer: examinee recognizes that if either a systolic or diastolic BP is high, the BP is considered high and should be confirmed (that is, if <i>either</i> the systolic BP is ≥ 140 mmHg <i>or</i> the diastolic BP is ≥ 90 mmHg, they should now perform a confirmatory measurement).]

Table 1. Omron Error Codes: code meanings and how to address them

Error Code	Explanation	How to Correct
Er 1	<p>Inflation error</p> <ul style="list-style-type: none"> When the pressure does not exceed 12 mmHg within the set time after the start of inflation When the inflation does not reach the set cuff pressure within the specified time after the start of inflation 	<ul style="list-style-type: none"> Confirm that the air tube connecting the cuff and the main unit is connected securely. Confirm that the air flow in the air tube connecting the cuff and the main unit isn't being restricted. Confirm that the cuff is wrapped correctly. Check bladder for leaks and, if necessary, replace the bladder with new one (option).
Er 2	<p>Deflation error</p> <ul style="list-style-type: none"> When the deflation speed is too fast during the measurement When the deflation speed is too slow during the measurement When the measurement does not finish within the specified time after starting the measurement 	<ul style="list-style-type: none"> Confirm that the air tube connecting the cuff and the main unit is connected securely. Confirm that the air flow in the air tube connecting the cuff and the main unit isn't being restricted. Confirm that the cuff is wrapped correctly. Check bladder for leaks and, if necessary, replace the bladder with new one (option).
Er 3	<p>Overpressure error</p> <ul style="list-style-type: none"> Cuff pressure exceeded 299 mmHg. 	<ul style="list-style-type: none"> Confirm that air flow in the air tube connecting the cuff and the main unit isn't being restricted.
Er 4	<p>Insufficient inflation error</p> <ul style="list-style-type: none"> BP could not be measured due to insufficient inflation level. 	<ul style="list-style-type: none"> If the measurement is made by setting the P-SET to "AUTO", ask the patient not to move during the inflation. Confirm that the P-SET is securely set to "AUTO". Turn the Knob counterclockwise as far as it goes until you can hear a click sound. If the measurement is made by manual inflation level setting, set the value to 30 to 40 mmHg higher.
Er 5	<p>Indeterminable BP error</p> <ul style="list-style-type: none"> BP could not be measured even when the cuff pressure reached the specified pressure. 	<ul style="list-style-type: none"> Confirm that the cuff is wrapped correctly.
Er 6	<p>Low pulse level error</p> <ul style="list-style-type: none"> Pulse wave was too small. 	<ul style="list-style-type: none"> Confirm that the cuff is wrapped correctly.
Er 7	<p>BP error</p> <ul style="list-style-type: none"> Relationship between systolic and diastolic pressures was abnormal. 	<ul style="list-style-type: none"> Ask the patient not to move during the measurement. Check the patient for active arrhythmia.
Er 8	<p>Pulse rate error</p> <ul style="list-style-type: none"> Pulse rate did not stay within the range of 30 to 199 beats/min. 	
Er 9	<p>Device error</p> <ul style="list-style-type: none"> Main unit malfunction. 	<ul style="list-style-type: none"> Contact OMRON Healthcare's Customer Service toll-free at 1-877-216-1336.