

S-FC02: Doppler ultrasound of the foot and ankle

Scope and objectives of clinical task

This CTI will enable the health professional to:

- accurately and safely measure arterial flow of the foot and ankle using a Doppler ultrasound to support risk categorisation if indicated by the findings from the implementation of CTI S-FC01: Assess the risk of foot complications.

VERSION CONTROL

Version: 1.0

Endorsed: (Professional) Queensland Hospital and Health Service Podiatry Steering Committee Date approved: 19/3/2019

Approved: (Operational) Chief Allied Health Officer, Allied Health Professions' Office of Queensland Date approved: 9/4/2019

Document custodian: Chief Allied Health Officer, Allied Health Professions' Office of Queensland Review date: 9/4/2022

Acknowledgements: Mackay Hospital and Health Service, Metro North Hospital and Health Service

The CTI reflects best practice and agreed process for conduct of the task at the time of approval and should not be altered. Feedback, including proposed amendments to this published document, should be directed to AHPOQ at: allied_health_advisory@health.qld.gov.au.

This CTI should be used under a skill sharing framework implemented at the work unit level. The framework is available at: <https://www.health.qld.gov.au/ahwac/html/calderdale-framework.asp>

Please check <https://www.health.qld.gov.au/ahwac/html/clintaskinstructions.asp> for the latest version of this CTI.

© State of Queensland (Queensland Health) 2019



This work is licensed under a Creative Commons Attribution Non-Commercial No Derivatives 3.0 Australia licence. This work is licensed under a Creative Commons Attribution Non-Commercial No Derivatives 3.0 Australia licence. In essence, you are free to copy and communicate the work in its current form for non-commercial purposes, as long as you attribute Queensland Health and authoring unit listed above, and abide by the licence terms. You may not alter or adapt the work in any way. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/3.0/au/deed.en>.

For further information contact Allied Health Professions' Office of Queensland, PO Box 2368, Fortitude Valley BC QLD 4006, email allied_health_advisory@health.qld.gov.au, phone (07) 3328 9298. For permissions beyond the scope of this licence contact: Intellectual Property Officer, Queensland Health, GPO Box 48, Brisbane Qld 4001, email ip_officer@health.qld.gov.au, phone (07) 3328 9862.

Disclaimer

Queensland Health has made every effort to ensure that the information in this resource, at the time of distribution, is correct. The information in this resource will be kept under review and future publications will incorporate any necessary amendments.

The information in this resource does not constitute clinical advice and should not be relied upon as such in a clinical situation. The information is provided solely on the basis that readers will be responsible for making their own assessment of the matters presented herein and readers are advised to verify all relevant representations, statements and information. Specialist advice in relation to the application of the information presented in this publication must be sought as necessary to ensure the application is clinically appropriate.

In no event, shall Queensland Health be liable (including negligence) for any claim, action, proceeding, demand, liability, costs, damages, expenses or loss (including without limitation, direct, indirect, punitive, special or consequential) whatsoever brought against it or made upon it or incurred by Queensland Health arising out of or in connection with a person's use of information in this publication

Requisite training, knowledge, skills and experience

Training

- Mandatory training requirements relevant to Queensland Health/HHS clinical roles are assumed knowledge for this CTI.
- Competence in or demonstrated professional equivalence in:
 - CTI S-FC01: Assess the risk of foot complications. S-FC02 provides competence in conducting a Doppler ultrasound at the foot and ankle and should be completed concurrently with S-FC01 if the skill share-trained health professional will implement S-FC01 with clients that require Doppler ultrasound of the foot and ankle.
 - CTI S-FC03: Calculate an Ankle Brachial Pressure Index (ABI) and Toe Brachial Pressure Index (TBI) should be completed concurrently with S-FC02 if the skill share-trained health professional will implement S-FC02 with clients that may require an ABI and TBI calculated. If the skill-share trained health professional does not complete S-FC03 training and competence information on local referral processes for ABI and TBI measurement is required.

Clinical knowledge

To deliver this clinical task a health professional is **required** to possess the following theoretical knowledge:

- the purpose of undertaking a Doppler measure of the arterial blood flow to the ankle and foot, including contraindications, precautions and limitations
- Doppler ultrasound unit features and the application process including bony landmarks for probe placement and orientation of the ankle and foot, client position and skin preparation
- basic foot anatomy to the extent required to undertake this CTI including names and locations of bony landmarks and areas of the foot and lower leg and the location of pedal pulses
- recognition of common signal and wave forms and technique errors and adaptations to the procedure that may be required to improve the accuracy of findings
- implications for client management of each wave form, including local procedures e.g. referral processes to a high-risk foot clinic, or vascular review by hospital or primary care physician.

The knowledge requirements will be met by the following activities

- review of the 'Learning Resource'
- receive instruction from the lead health professional in the training phase
- read and discuss the following references/resources with the lead health professional at the commencement of the training phase:
 - local referral pathways for vascular review.

Skills or experience

The following skills or experience are not specifically identified in the task procedure but support the safe and effective performance of the task or the efficiency of the training process and are:

- **required** by a health professional in order to deliver this task:
 - nil
- **relevant but not mandatory** for a health professional to possess in order to deliver this task:
 - previous experience with electro modalities e.g. therapeutic ultrasound machine.

Indications and limitations for use of a skill shared task

The skill share-trained health professional shall use their independent clinical judgement to determine the situations in which he/she delivers this clinical task. The following recommended indications and limitations are provided as a guide to the use of the CTI but the health professional is responsible for applying clinical reasoning and understanding of the potential risks and benefits of providing the task in each clinical situation.

Indications

- The client has a non-palpable or diminished dorsalis pedis and/or posterior tibial pulse.

Limitations

- Limitations listed in CTI S-FC01 apply.
- The client must be able to lie still during the examination. For clients with tremors, involuntary or uncontrolled movements due to muscle spasm or cognitive problems including impulsivity or aggression, consider timing the examination to coincide with medication regimes or when carer support is available.

Safety and quality

Client

The skill share-trained health professional shall identify and monitor the following risks and precautions that are specifically relevant to this clinical task:

- if the client is wearing tight or close-fitting trousers, determine if they need to be removed. Generally, pants or trousers can be rolled up to allow inspection of the ankle and calf, however if clothing is firm or tight this will restrict blood flow and make examination difficult. If clothing removal is required, ensure modesty is maintained e.g. a gown to wear or a towel to drape across the lap.
- the client has a foot ulcer at the site where the Doppler ultrasound probe will be placed. It is easier and preferable to avoid the area and obtain the Toe Brachial Pressure Index (TBI). If the skill share-trained health professional has been trained and assessed as competent in CTI S-FC03: Calculate an Ankle Brachial Pressure Index (API) and Toe Brachial Pressure Index (TBI), implement S-FC03 to obtain the TBI or implement local referral processes for TBI measurement.

Equipment, aids and appliances

- As this assessment includes the use of electrical equipment, all equipment should be examined to ensure it is in good working order e.g. cords not frayed, switches are working properly and if in a Queensland Health facility, test and tag is in situ and current. If the equipment is not in working order, cease the task. Locate alternative equipment if available. If no alternative equipment is available inform the client (and carer where relevant) and re-schedule the task and implement local processes to have the equipment fixed/replaced.
- Ultrasound probes are designed to be used with ultrasound gel. The use of KY jelly or other lubricants can damage the crystals in the probe head and should not be used. If ultrasound gel is not available, cease the task and liaise with a health professional with expertise in the task.

Environment

- To reduce background noise, clinician headphones are available for some units and may be beneficial.

Performance of Clinical Task

1. Preparation

- Equipment should be cleaned with alcohol wipes prior to use, including the probe.

2. Introduce task and seek consent

- The health professional checks three forms of client identification: full name, date of birth, plus one of the following: hospital UR number, Medicare number, or address
- The health professional introduces the task and seeks informed consent according to the Queensland Health Guide to Informed Decision-making in Health Care, 2nd edition (2017).

3. Positioning

- The client's position during the task should be:
 - seated on the bed/plinth or couch with leg supported. The client should be comfortable and relaxed.
- The health professional's position during the task should be:
 - in a position to be able to easily access the client's ankle and operate the ultrasound machine.

4. Task procedure

- The task comprises the following steps:
 1. Ask the client to remove their shoes and clothing around the ankle. See the 'Safety and quality' section.
 2. Explain the procedure to the client including the probe placement, use of gel and sounds that will be heard. If required, provide a demonstration.
 3. Palpate the dorsalis pedal pulse area with the fingers and place the ultrasound gel over the pulse area.
 4. Place the head of the probe into the gel, pointing towards the heart/blood flow at an angle of 40-60 degrees. This angles the probe to present the sound wave to the largest cross-section of the vessel.
 5. Turn on the Doppler machine. The machine will demonstrate that it is working with an audible noise (squelch).
 6. Identify the sound wave.
 7. Determine if the sound wave is tri-phasic, bi-phasic, monophasic or venous reflux. If the Doppler ultrasound does not demonstrate triphasic wave forms, implement process for TBI measurement e.g. CTI S-FC03: Calculate an Ankle Brachial Pressure Index (API) and Toe Brachial Pressure Index (TBI).
 8. Palpate the posterior tibial pulse with the fingers and place the ultrasound gel over the pulse area. Repeat steps 4-7.

9. Turn off the machine, remove the probe from contact with the client. Gently wipe any excess gel off the client's skin using a tissue and clean the probe with alcohol wipes.
 10. Record the findings on the local recording form.
- As this CTI is implemented as part of CTI S-FC01: Assess the risk of foot complications, required interventions are included as part of the clinical reasoning in S-FC01. If this CTI is being used for other purposes, the local service will need to identify and implement additional training requirements for appropriate management plans for the Doppler assessment findings.

5. Monitoring performance and tolerance during the task

- Common errors and compensation strategies to be monitored and corrected during task include:
 - clients who are tense may contract their muscles which will compress the underlying vessels, making the pulse more difficult to find due to a smaller cross section. Tension can be reduced by ensuring that the client is positioned comfortably, understands the procedure and has the opportunity to ask questions. Clients who are tense should be encouraged to relax their muscles.
 - if the client has absent pulses, place the probe in the general area of the anatomical reference and expand out slowly to account for any anatomical anomalies. If the audible sound of the pulse is not heard, use a slow gentle circular movement in a zig-zag pattern
 - if the signal quality is poor, maintain the probe head in contact with the skin and move the base of the probe in an arc to re-orientate the probe to improve the sound quality
 - signal quality is affected by air. The probe head should be completely immersed in the gel when placed on the client's skin. If gaps are present, add more gel.
- Monitor for adverse reactions and implement appropriate mitigation strategies as outlined in the 'Safety and quality' section above.

6. Document

- Document the outcomes of the task as part of the skill-share trained health professional's entry in the relevant clinical record, consistent with relevant documentation standards and local procedures.
- The skill shared task should be identified in the documentation as 'delivered by skill share-trained (insert profession) implementing S-FC02: Doppler ultrasound of the foot and ankle'.

References and supporting documents

- Queensland Health (2017). Guide to Informed Decision-making in Health Care (2nd edition). https://www.health.qld.gov.au/_data/assets/pdf_file/0019/143074/ic-guide.pdf

Assessment: Performance Criteria Checklist

S-FC02: Doppler ultrasound of the foot and ankle

Name:

Position:

Work Unit:

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
Demonstrates knowledge of fundamental concepts required to undertake the task through observed performance and the clinical reasoning record.			
Identifies indications and safety considerations for the task and makes appropriate decisions to implement the task, including any risk mitigation strategies, in accordance with the clinical reasoning record.			
Completes preparation for the task including checking the machine is in working order and clean.			
Describes the task and seeks informed consent.			
Prepares the environment and positions self and client appropriately to ensure safety and effectiveness of the task, including reflecting on risks and improvements in the clinical reasoning record where relevant.			
Delivers the task effectively and safely as per the CTI procedure, in accordance with the Learning Resource. a) Clearly explains and demonstrates the task, checking the client's understanding. b) Ensures the client removes shoes and clothing around the ankle. c) Locates the dorsalis pedal pulse and correctly places the ultrasound gel and probe over the pulse area. d) Correctly turns on the Doppler machine. e) Identifies the sound wave and determines type. f) If required implements CTI S-FC03: Calculate an Ankle Brachial Pressure Index (API) and Toe Brachial Pressure Index (TBI). g) Locates the posterior tibial pulse and correctly places the ultrasound gel and probe over the pulse area. Repeats steps 4-7. h) Turns off the machine, removes the probe from contact with the client, safely removes gel off the client's skin and cleans the probe. i) Records the findings on the local recording form. j) During the task, maintains a safe clinical environment and manages risks appropriately.			
Monitors for performance errors and provides appropriate correction, feedback and/or adapts the			

task to improve effectiveness, in accordance with the clinical reasoning record.			
Documents in the clinical notes including a reference to the task being delivered by the skill share-trained health professional and the CTI used.			
If relevant, incorporates outcomes from the task into an intervention plan e.g. plan for task progression, interprets findings in relation to care planning, in accordance with the clinical reasoning record.			
Demonstrates appropriate clinical reasoning throughout the task, in accordance with the Learning Resource.			

Comments:

Record of assessment competence:

Assessor name:	Assessor position:	Competence achieved: / /
----------------	--------------------	--

Scheduled review:

Review date: / /
--

S-FC02: Doppler ultrasound of the foot and ankle

Clinical Reasoning Record

The clinical reasoning record can be used:

- as a training resource, to be completed after each application of the skill shared task (or potential use of the task) in the training period and discussed in the supervision meeting
- after training is completed for the purposes of periodic audit of competence
- after training is completed in the event of an adverse or sub-optimal outcome from the delivery of the clinical task, to aid reflection and performance review by the lead practitioner.
- The clinical reasoning record should be retained with the clinician's records of training and not be included in the client's clinical documentation.

Date skill shared task delivered: _____

1. Setting and context

- insert concise point/s outlining the setting and situation in which the task was performed, and their impact on the task

2. Client

Presenting condition and history relevant to task

- insert concise point/s on the client's presentation in relation to the task e.g. presenting condition, relevant past history, relevant assessment findings

General care plan

- insert concise point/s on the client's general and profession-specific/allied health care plan e.g. acute inpatient, discharge planned in 2/7

Functional considerations

- insert concise point/s of relevance to the task e.g. current functional status, functional needs in home environment or functional goals. If not relevant to task - omit.

Environmental considerations

- insert concise point/s of relevance to the task e.g. environment set-up/preparation for task, equipment available at home and home environment. If not relevant to task - omit.

Social considerations

- insert concise point/s of relevance to the task e.g. carer considerations, other supports, client's role within family, transport or financial issues impacting care plan. If not relevant to task - omit.

Other considerations

- insert concise point/s of relevance to the task not previously covered. If none - omit.

3. Task indications and precautions considered

indications and precautions considered

- insert concise point/s on the indications present for the task, and any risks or precautions, and the decision taken to implement/not implement the task including risk management strategies.

4. Outcomes of task

- insert concise point/s on the outcomes of the task including difficulties encountered, unanticipated responses

5. Plan

- insert concise point/s on the plan for further use of the task with this client including progression plan (if relevant)

6. Overall reflection

- insert concise point/s on learnings from the use of the task including indications for further learning or discussion with the lead practitioner

Skill share-trained health professional

Name:

Position:

Date this case was discussed in supervision:

Outcome of supervision discussion:

Lead health professional (trainer)

Name:

Position:

/ /

e.g. further training, progress to final competency assessment

Doppler ultrasound of the foot and ankle: Learning resource

Background

Medical ultrasound is a diagnostic imaging technique that uses very high frequency sound waves to examine internal body structures. The sound waves have a pitch too high for the human ear to hear. When the sound waves originate or are reflected from a moving object their wavelength and frequency changes. This is called the “Doppler effect” and is the audible sound that is heard when the Doppler picks up the blood flow.

Required reading

- Ultrasoundpaedia™ (2018). Ultrasound of the leg arteries – Normal. Available at: <http://www.ultrasoundpaedia.com/normal-leg-arteries/>
- Manufacturers instructions for the machine to be used in the local service.

Optional reading

- Young M, Birch I, Potter CA, Saunders R, Otter S, Hussain S, Pellett J, Reynolds N, Jenkin S, Wright W (2013). A comparison of the Doppler ultrasound interpretation by student and registered podiatrists. Journal of Foot and Ankle Research 6:25. Available at <https://jfootankleres.biomedcentral.com/articles/10.1186/1757-1146-6-25>

Required viewing

- Gregory Weir (2015). Triphasic Doppler Flow. Available at: <https://www.bing.com/videos/search?q=doppler+ultrasound+interpretation+ankle+biphasic&&view=detail&mid=1EE3616293872D3B91751EE3616293872D3B9175&&FORM=VRDGAR>
- JAMA (2014). Doppler Auscultation of the Posterior Tibial Artery. Available at: <https://www.bing.com/videos/search?q=Triphasic+vs+Biphasic+Doppler+Flow&&view=detail&mid=7D60B1F622B1AA49C87C7D60B1F622B1AA49C87C&rvsmid=FC18804FEB1F4BCA2BC6FC18804FE B1F4BCA2BC6&FORM=VDRVRV>
- Philip Mann (2015). Doppler Assessment for Arterial Blood Supply to the feet. Available at: <https://www.bing.com/videos/search?q=doppler+ultrasound+interpretation+ankle&&view=detail&mid=5A2D4F4B3D428301D3405A2D4F4B3D428301D340&&FORM=VRDGAR>