

The sensitivity of ultrasound in detecting choledocholithiasis compared to other imaging modalities

Amy Dumigan & Ruth Reeve

Aim
Assess the US accuracy of detecting choledocholithiasis compared to other imaging modalities.

Methods
A retrospective cross-sectional analysis was conducted on examinations between April 2022 – March 2023, evaluating and comparing radiology exams and reports prior to ERCP examination.

Results
168 patients underwent an ERCP for removal of bile duct stones between April 2022 – March 2023.

132 patients (78.6%) had a prior US examination of which 48 patients (36.4%) were identified as having a diagnosis of choledocholithiasis, resulting in a sensitivity of 35%.

87 patients with a negative initial US examination had further imaging, 80 patients received a positive MRI diagnosis, and 14 patients received a positive diagnosis from CT. Choledocholithiasis was not diagnosed during MRI in 6 patients or CT in 4 patients.

MRI was the first imaging modality for 7 patients, of which 6 had a positive diagnosis of choledocholithiasis.

A total of 16 patients only underwent CT investigation prior to ERCP, in which 2 patients were deemed to have a normal CBD, they then proceeded to have an MRI which positively identified choledocholithiasis.

The detection rate from each imaging modality in positively identifying choledocholithiasis is:

- US = 36.4% with a sensitivity of 35%
- CT = 67.1% with a sensitivity of 66%
- MRI = 93% with a sensitivity of 93%

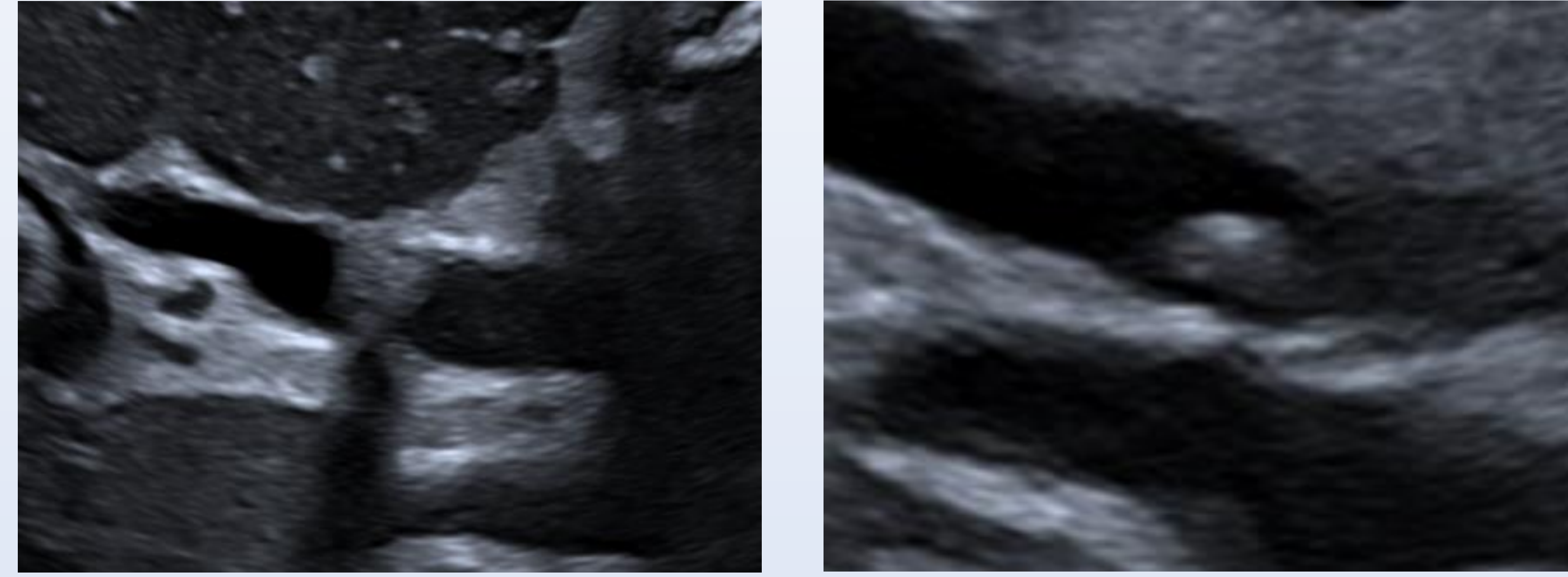


Figure 1 and 2 – US images demonstrating a gallstone within the CBD

Discussion
The current NICE guideline for elevated LFTs and abdominal pain, with a working diagnosis of gallstones is an initial ultrasound examination, if the bile duct is dilated but there is no evidence of gallstones then an MRCP examination should be performed. However, if the MRCP is inconclusive an endoscopic ultrasound examination should be considered. Figure 7 demonstrates the pathway for suspected diagnosis (Williams et al., 2017). Based on our audit findings adherence to the NICE guidelines is not always followed, with some patients not having an initial ultrasound as the primary investigation.

Our findings demonstrate MRI has a higher sensitivity than CT and US for detection of choledocholithiasis, with an overall low sensitivity for US (35%). These findings demonstrate a lower detection rate for US than what is suggested in published studies, particularly identified by a study from Alkarboly et al., (2016), which saw an US sensitivity of 80% in detecting choledocholithiasis and a specificity of 87.5%.

The challenges faced when using US to detect gallstones were identified as a lack of posterior shadowing, small stones that are embedded in the bile duct wall will not be as easily identified as those that are mobile within the lumen and bowel gas obstructing the distal common bile duct. The researcher's identified these challenges on the US images within the audit, and the detection rate of choledocholithiasis was significantly lower compared to MRI.

US is considered fast, cost-effective and non-invasive in the first line of investigation, which is why NICE guidelines consider US as the first form of imaging for diagnosis. Although, MRI is more superior in diagnosing choledocholithiasis, particularly within this audit.

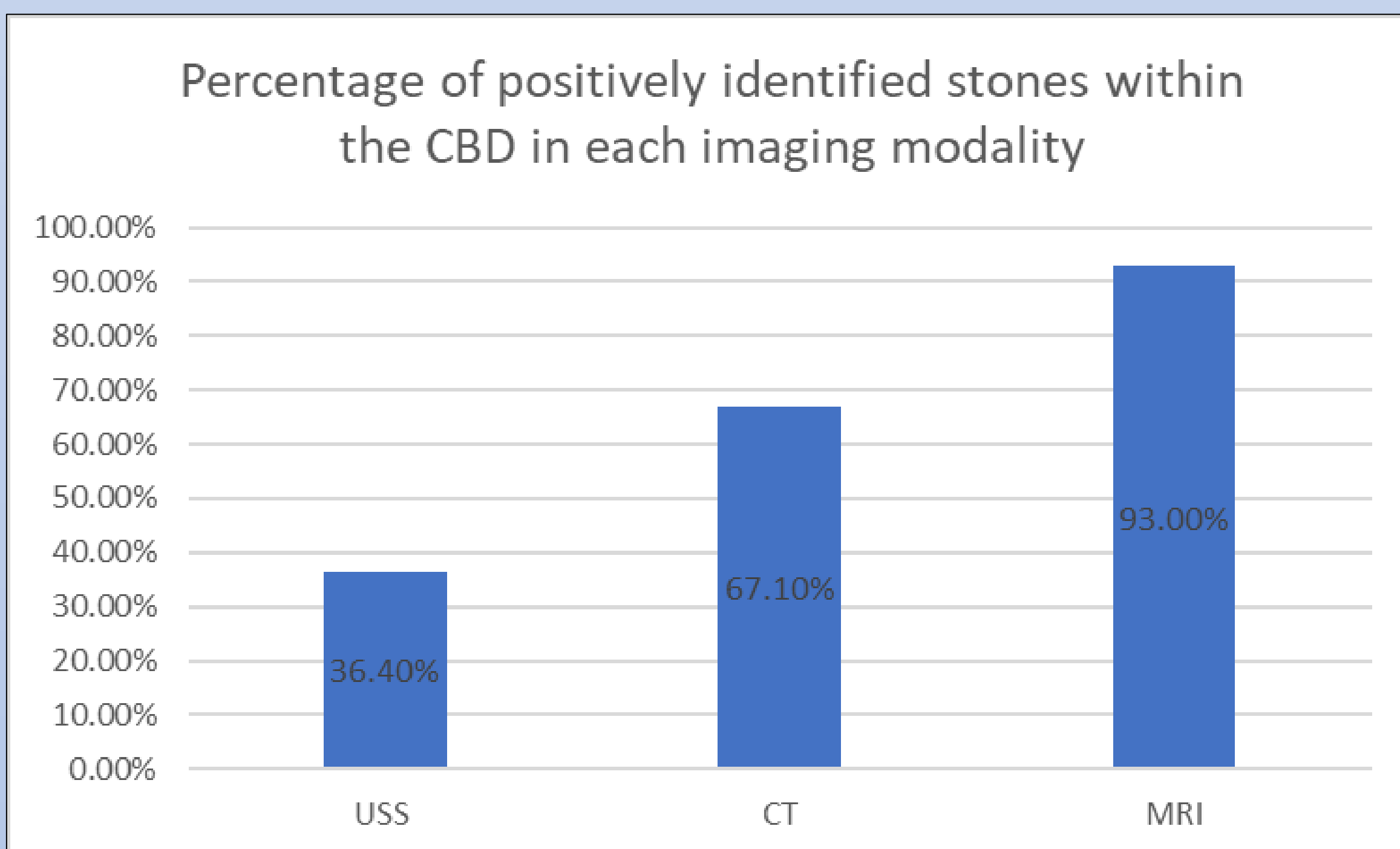


Figure 3 – Graph showcasing the accuracy of each imaging modality at detecting choledocholithiasis



Figure 5 – US image with a gallstone in the CBD



Figure 6 – US image demonstrating posterior shadowing

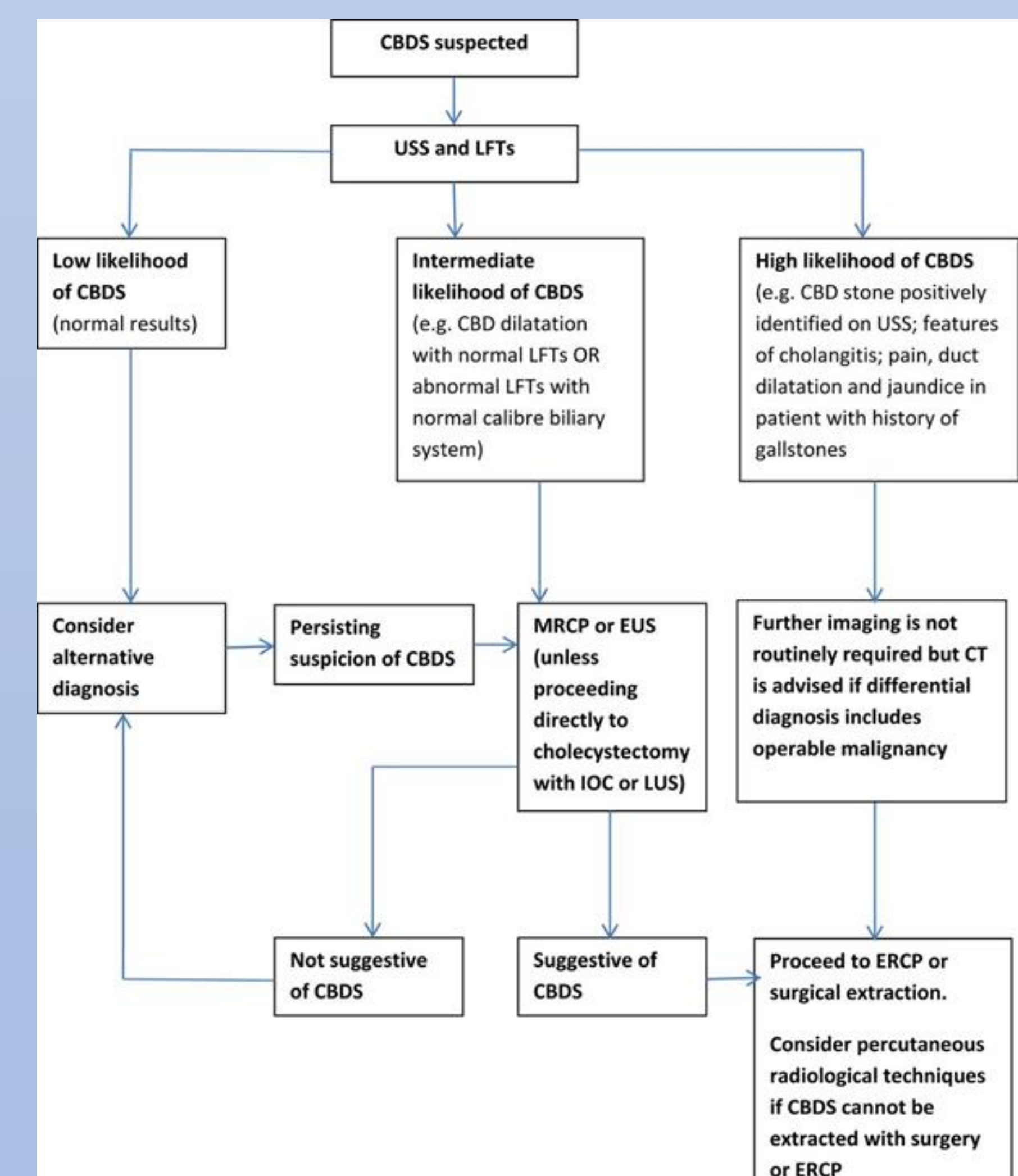


Figure 7 – Pathway for suspected choledocholithiasis (Williams et al., 2017)

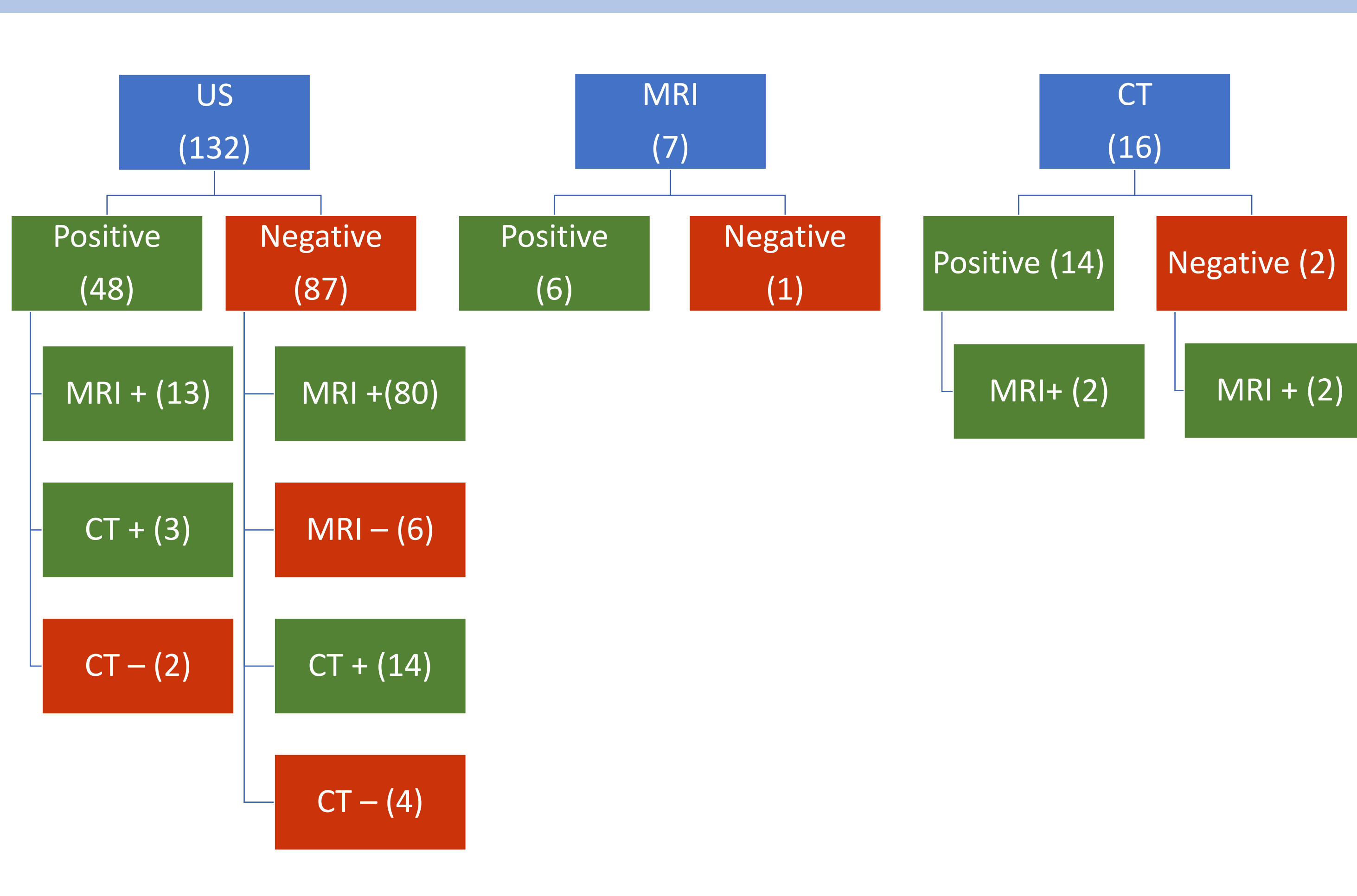


Figure 4 – Flow diagram identifying the positive and negative detection rate for each imaging modality

Conclusion
US is often the first line of investigation in assessing the gallbladder and bile ducts however, the detection rate at our local teaching hospital is poor compared to MRI. The use of US is considered because of its accessibility, tolerability, and is considered inexpensive, although the results of this audit suggest that either more training is required for US practitioners assessing for choledocholithiasis or that patients may benefit from having an MRI when demonstrating symptoms of choledocholithiasis.

References
Alkarboly, T.A.M., Fatih, S.M., Hussein, H.A., Ali, T.M. & Faraj, H.I. (2017). The Accuracy of Transabdominal Ultrasound in Detection of the Common Bile Duct Stone as Compared to Endoscopic Retrograde Cholangiopancreatography (with Literature Review). *Open Journal of Gastroenterology*, 6(10).
Williams, E., Beckingham, I., El Sayed, G., Gurusamy, K., Sturgess, R., Webster, G. & Young, T. (2017). Updated guideline on the management of common bile duct stones (CBDS). *Gut*, 66(5), 765-782.