



# Current Role of Artificial Intelligence in the Management of hilar Cholangiocarcinoma: A Narrative Review and Meta-style Synthesis

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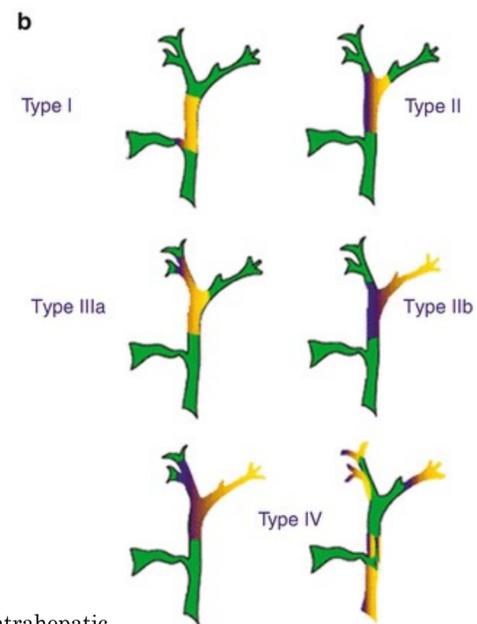
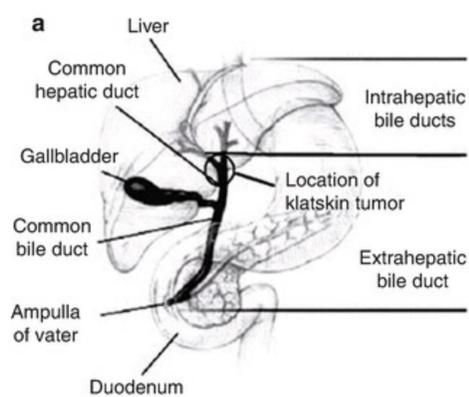
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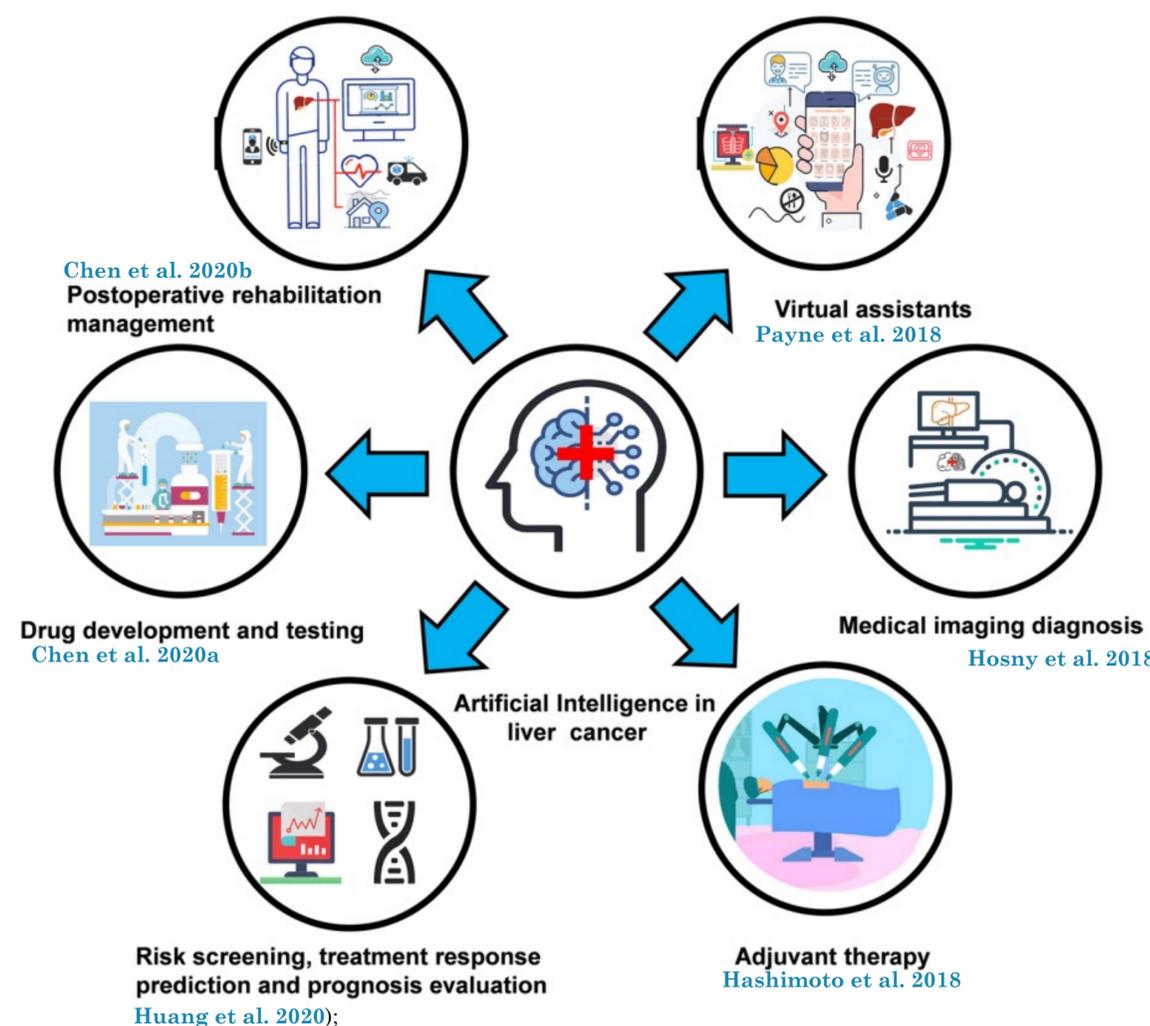
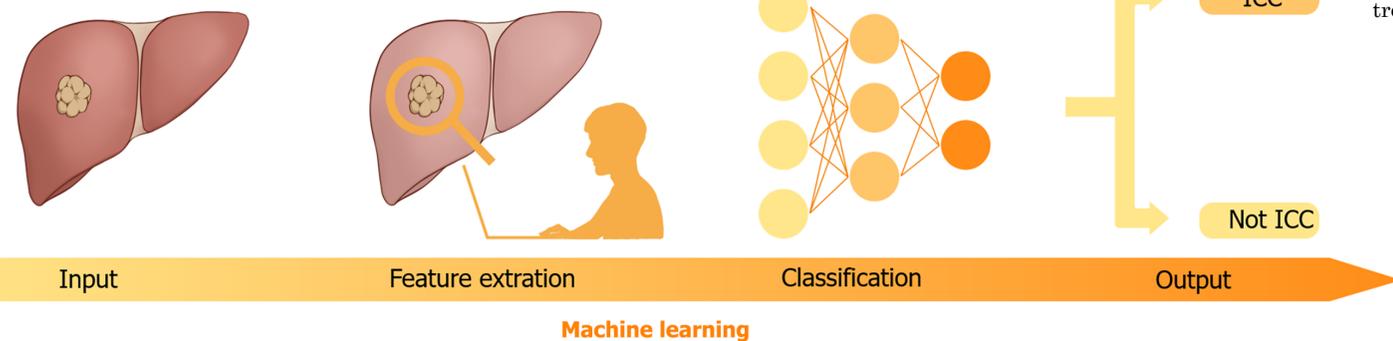


**Hilar cholangiocarcinoma (Klatskin tumour) is a rare malignancy, with an annual incidence  $\leq 1/100,000$  with a reported poor prognosis. Population and single-center series report 5-year overall survival after resection in the range of ~30–40%, while non-resectable disease is associated with median survivals often  $< 1$  year. These epidemiologic and biologic features, together with often complex biliary and vascular anatomy, motivate exploration of artificial intelligence (AI) methods (machine learning, deep learning, radiomics) to improve diagnosis, staging, operative planning and prognostication.**

**Figure 1.** Klatskin Tumors. (a) Anatomical location (b) Bismuth-Corlette classification. Welzel, T.M. et al, Encyclopedia of Cancer. Springer, Berlin, Heidelberg.

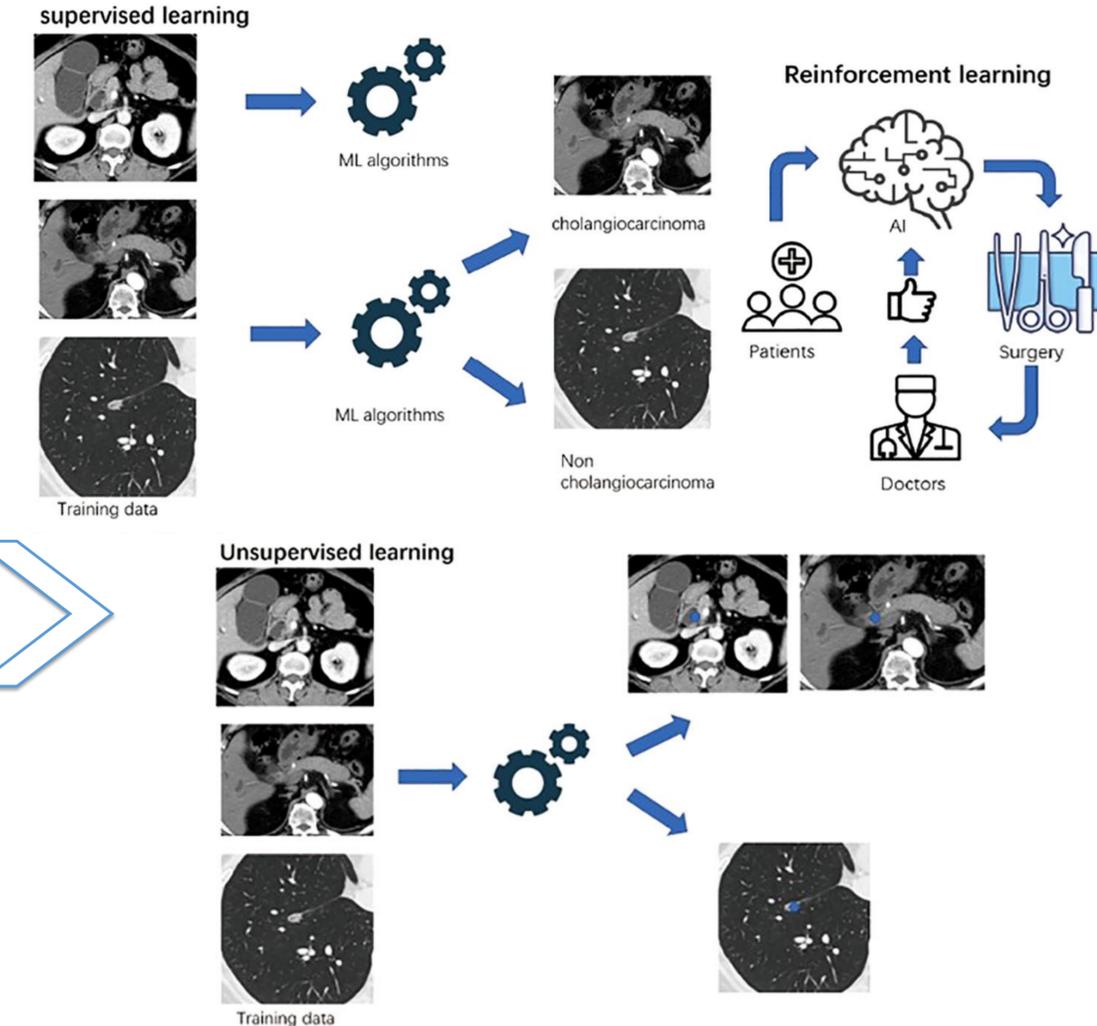


**Figure 2.** Workflow of machine learning. ICC: Intrahepatic cholangiocarcinoma. Qiao L, et al. Artificial intelligence in the diagnosis and prognosis of intrahepatic cholangiocarcinoma: Applications and challenges. World J Gastrointest Oncol 2025; 17(10): 111367



**Figure 3.** Schematic diagram of artificial intelligence in the precise diagnosis and treatment of liver cancer.

**AI-augmented radiology improves discrimination of malignant from benign hilar strictures and facilitates automated segmentation for vascular and biliary reconstruction planning. Digital pathology using AI has shown promise in detecting perineural and lymphovascular invasion for refined prognostication. As for intraoperative applications, including augmented-reality overlays, automated anatomical segmentation, and AI-assisted robotic navigation, have been piloted for dissection and margin assessment.**



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