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The role of nursing in the management of patients with renal and hepatic cancers: A systematic literature review

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ABSTRACT

Purpose: This systematic literature review identified publications evaluating the role and benefits of nurse-led care in the management of patients with a diagnosis of renal cell carcinoma (RCC) or hepatocellular carcinoma (HCC).

Methods: The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance. Structured searches of the PubMed database and the EMCare nursing and allied health database were conducted (August 11, 2021). Eligible publications were English-language, full-text, peer-reviewed journal articles featuring HCC and/or RCC populations, interventions involving nurses, any/no comparators, and reporting any related healthcare outcomes. Data on study design and size, patient characteristics and impact of nursing care were extracted.

Results: Fifty-six relevant articles were identified (43 on HCC; 10 on RCC; 3 on HCC and RCC). The literature described the role and impact of oncology nurses across a variety of care functions, including in health promotion and screening, care coordination, holistic oversight, symptom and adverse event monitoring and management, and emotional support. Twenty-nine empirical studies/case reports were identified demonstrating benefit of nurse-led interventions in HCC/liver cancer (n = 28) and RCC (n = 1). Benefits were achieved through: improved patient participation in screening programs; reduced time to diagnosis; improved treatment adherence, reduced treatment complications, dose reductions and outpatient visits, and potential cost savings.

Conclusions: The oncology nurse plays a multifaceted role in the care of patients with HCC and RCC, but more evidence from nurse-led interventions is required to guide optimal multidisciplinary care of patients with these conditions.

1. Introduction

Optimum cancer management is delivered by a range of health and ancillary care professionals operating as part of a multidisciplinary team (MDT) (Yang and Heimbach, 2020). Oncology nurses play an integral role in care provision, from initial screening and disease detection to patient assessment and education. As central MDT members, oncology nurses are critical to the overall coordination of care, and are uniquely positioned to identify novel opportunities/interventions for improving patient experience (Bell et al., 2017; Charalambous et al., 2018).

Studies assessing the impact of oncology nurse-led interventions are lacking (Charalambous et al., 2018), probably more so in less prevalent cancers such as renal cell carcinoma (RCC) and hepatocellular carcinoma (HCC). Yet the clinical burden of RCC and HCC, as well as their rapidly evolving treatment landscapes, call for greater consideration of oncology nurses' contributions in optimizing the management of these conditions.

Targeted therapies and immunotherapies are transforming the treatment paradigm for RCC and HCC (Bouattour et al., 2019; Motzer et al., 2019). These therapeutic advances bring with them the promise of patient benefit, but also the need to understand any potential complexities of new care provisions. For example, combination approaches may increase the risk of treatment-related adverse events (AEs), thus information provision and closer monitoring of patients are vital,

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especially until long-term safety data are available. A systematic review of nurse-led interventions in oncology, more broadly, concluded that nurses can provide complex interventions across the entire cancer spectrum, including playing key roles in patient assessment, monitoring and care management (Charalambous et al., 2018). As such, effective oncology nurse-led interventions could potentially: increase access to care; improve patient education, treatment adherence and patient satisfaction; and facilitate cost-effective care by reducing hospital admissions and lengths of stay (Mick, 2008).

The aim of this systematic literature review was to identify the evidence base available to guide the role of nurses working in HCC and RCC.

2. Methods

Eligible studies were identified in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidance (Moher et al., 2009). Systematic literature searches were conducted in the PubMed database and the EMCare nursing and allied health bibliometric database (on August 11, 2021). The search strings included title and abstract keyword searches relating to the populations of interest (patients with HCC or RCC) and nursing (see Supplementary Tables S1 and S2 for full search strings). All publications were de-duplicated and unique articles screened for eligibility.

Eligible articles were published in peer-reviewed journals and featured HCC and/or RCC populations, interventions involving nurses, any or no comparators, and reported any related healthcare outcomes (e.g., patient outcomes, family member/carer outcomes, impact on service provision and/or cost). In anticipation of a paucity of empirical evidence, relevant publications were included regardless of publication type, study design, or patient number, i.e., case studies, short reports/letters to editor, systematic literature and narrative reviews were eligible, as were prospective and retrospective original research articles. Publications were limited to those with English-language full texts, but no publication date or geographical limits were imposed.

Two reviewers independently screened publications for eligibility. Screening was initially carried out by title/abstract. Publications deemed potentially eligible underwent full-text screening for PICO alignment, i.e., HCC and/or RCC population; nursing intervention; any or no comparator, and any healthcare outcome. The final list of eligible articles was reviewed and approved by the full author group before data extraction.

Data extraction was conducted independently by two reviewers and documented in tabular form. Extracted data included: citation details; publication type; study design; indicator of study size (e.g. number of patients included or nurses involved); population of interest (patients with HCC and/or RCC); focus of nursing care (e.g. diagnosis, surveillance, AE monitoring, care continuity, patient education, emotional support); and impact of nursing care, when available.

No risk of bias (RoB) assessment was conducted. The heterogeneity of the included literature meant that no single RoB tool that would be relevant for all publications and any such assessment would offer limited meaningful insight into the RoB present. Further, no pooled synthesis of the evidence requiring RoB appraisal for data inclusion was conducted. As an indicator of the size and power of the datasets on which the authors of each publication based their conclusions, details of the study/sample size were extracted and are summarized in the Results.

3. Results

The literature searches identified 301 articles (199 in PubMed; 102 in EMCare). One additional author-identified article was also included. After article de-duplication, 269 articles were screened for eligibility (269 title/abstract screening; 72 full-text screening). In total, 56 articles were included in the review (Fig. 1).

Most articles related to HCC (43 articles); ten articles related to RCC and three covered both HCC and RCC. Of the included articles: 33.9% (n = 19) were narrative reviews; 19.6% (n = 11, including 1 randomized controlled trial) were prospective studies, involving 1101 patients and 13 family caregivers; 12.5% (n = 7) were retrospective studies,

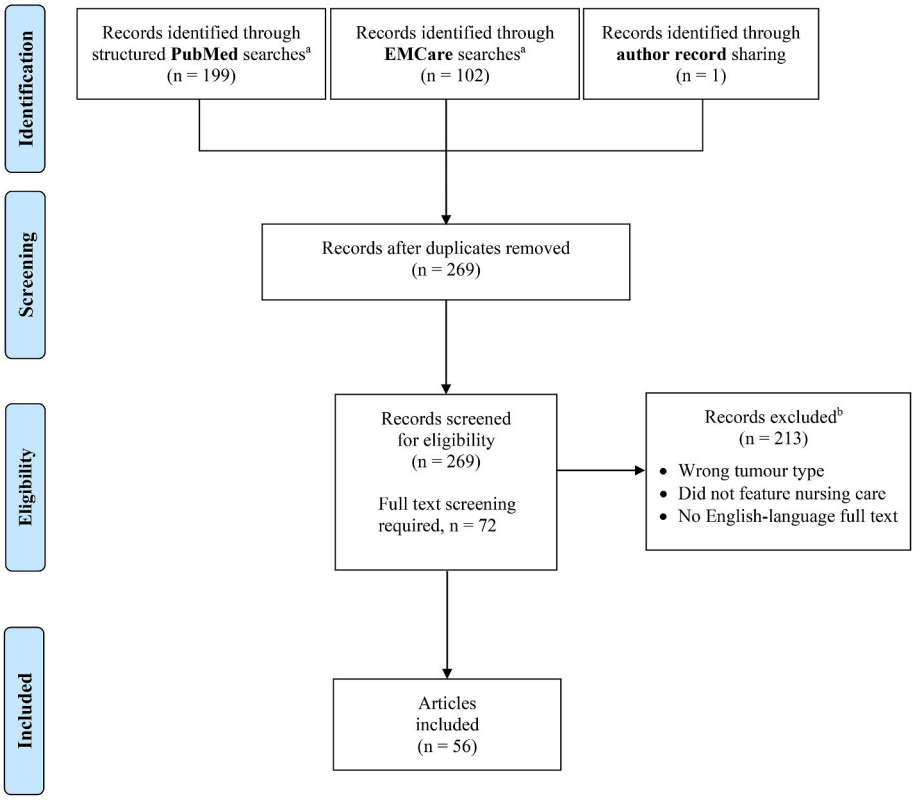


Fig. 1. PRISMA flow diagram.
[a] Search run on August 11, 2021. [b] Reasons for exclusion: population not of interest (i.e., not related to care of patients with HCC or RCC); intervention not of interest (i.e. no details of nursing care); full text not available in English.
CINAHL = Cumulative Index to Nursing and Allied Health Literature; HCC = hepatocellular carcinoma; RCC = renal cell carcinoma.

involving 1680 patients; 10.7% (n = 6) were case studies, each featuring a single patient; 10.7% (n = 6) were systematic reviews, featuring 145 studies; 8.9% (n = 5) were the results of surveys or interviews, involving 1685 respondents (patient and healthcare professionals), and 3.6% (n = 2) were clinical guidelines and recommendations.

As summarized later (and in Table 1), the literature described the role and potential benefit of oncology nursing role in a range of positions across the care pathway, including in: health promotion and screening; coordination among MDT colleagues, additional support staff and patients; building rapport and emotional support with patients and caregivers; symptom monitoring and AE management; patient education; optimizing treatment; and holistic support and oversight.

3.1. Health promotion and screening

Early diagnosis can improve treatment outcomes and overall survival in HCC (American Cancer Society, 2021); however, HCC is generally asymptomatic in the early stages and patients often receive a diagnosis late in the disease course (Wu et al., 2020). Screening high-risk populations, such as individuals with hepatitis B, is one means of improving HCC detection and diagnosis (Boyle, 2017). With well-established risk factors for HCC, global and national guidelines recommend 6-monthly ultrasound surveillance in high-risk populations (Balaceanu, 2019). Nurses can support screening programmes by educating at-risk individuals to participate, offering healthy lifestyle advice and implementing practical measures to support attendance (Noble and Page, 2012; Reynolds et al., 2018; Sheppard-Law et al., 2018). Nurses can also facilitate ultrasound screening by ensuring that patients are well prepared and, in some hospitals, advanced clinical nurse practitioners can also order ultrasounds (Mortimore and Mayes, 2019) and other investigative procedures. In a survey of UK hepatologists, gastroenterologists and nurse specialists, 97.1% of respondents reported the existence of an ultrasound screening programme for HCC in their hospital. Yet only 21.0% of these services were reportedly arranged by specialist nurses (Cross et al., 2016).

The benefits of nurse involvement in HCC screening are reported in several studies (Aberra et al., 2013; Kennedy et al., 2013; Maher et al., 2021; Nazareth et al., 2016). A nurse-led community-based liver disease screening programme in high-risk individuals found evidence of liver disease in 13.2% (of 926 individuals screened), illustrating the value of such initiatives in supporting early identification of chronic liver diseases and HCC (Maher et al., 2021). A nurse-led HCC surveillance clinic for patients with cirrhosis or advanced fibrosis in a hospital in Perth (n = 76), Australia, led to 30.3% of patients receiving follow-up ultrasounds within 6 months of their previous ultrasound, and 71.2% receiving them within 7 months. Following establishment of the nurse-led service, intervals of less than 9 months between monitoring appointments were associated with clinical improvements (Nazareth et al., 2016). In another nurse-led initiative in Australia, system redesign and interventions to increased physician education and patient understanding of the importance of surveillance were introduced to improve adherence to screening guidelines in patients with viral hepatitis (Kennedy et al., 2013). On assessment, 92% of patients (46% before service optimization) were found to have received appropriate HCC surveillance during the prior 6 months, and 64% (0% before service optimization) in the prior 2 years ($p < 0.001$ in each instance) (Kennedy et al., 2013; Wundke et al., 2019). Overall, patients exposed to the service received a diagnosis of HCC at an earlier stage and had a lower mortality than patients who received a diagnosis of HCC in the same health region through usual care practices (Wundke et al., 2019).

Well-defined, nurse-led HCC surveillance protocols are important to enable timely diagnosis and implementation of appropriate management strategies (Nazareth et al., 2016). In a US study, nursing-based protocols integrated with automatic appointment reminders significantly increased patient participation (n = 355) in HCC surveillance from 74% to 93% ($p < 0.001$) (Aberra et al., 2013). An algorithm has since been developed to facilitate nurse-led screening for, and subsequent vaccination and management of, patients with hepatitis B (McHugh et al., 2011). Published guidance instructs nurse practitioners on how to use the algorithm to identify individuals who may benefit from screening and follow up, including details of additional tests, monitoring requirements, and appropriate referral for consideration (Tarrant et al., 2013).

Five-year survival rates in patients with RCC depend on the disease stage at time of diagnosis (American Cancer Society, 2020). Advances in imaging have improved the timely diagnosis of RCC; however, only half of all cases are diagnosed at an early stage (Noble and Page, 2012). Although evidence supporting nurse-led screening and diagnostic interventions in RCC is lacking, oncology nurses can contribute to the prevention of RCC by offering lifestyle advice, and encouraging people to avoid/stop smoking and to maintain a healthy weight (Noble and Page, 2012).

3.2. Care coordination

Cancer MDTs are generally networks of healthcare professionals (HCPs) from a range of specialisms who work collaboratively with a wider hospital-based ancillary care team and may include community-based professionals (Fig. 2). Effective communication among MDT specialties is central to collective decision-making, and is necessary for efficient care coordination, delivery of high standards of care and positive treatment outcomes (Hull and Armstrong, 2010; Moldawer and Wood, 2020). A recent questionnaire-based study investigating the distribution and role of nurse coordinators in France found wide heterogeneity in the function(s) provided by nurse coordinators, but the provision of patient information and counselling was common to the role across all of the 42 participating sites (Devictor et al., 2021). Nurses can help to overcome barriers and inefficiencies by facilitating prompt communication between patients and primary care services, and ensuring timely community-based investigations (Ow et al., 2017). For example, in a nurse-led hepatology/oncology clinic in London, UK, for patients with HCC (O'Donoghue et al., 2019), the clinical nurse specialist coordinated MDT meetings, for pre- and post-meeting communication with the patient, and initiated the treatment pathway. The appointed nurse also monitored weekly clinic numbers and prioritized patients, which improved the efficiency of patient triage (O'Donoghue et al., 2019). Service evaluation found that the average time from diagnosis to treatment reduced from 4 months to 1 month or less, and use of available treatments increased significantly during the time that the nurse coordinator was in post (O'Donoghue et al., 2019). A similar initiative was introduced at a clinic in South Australia, where a nurse coordinator was appointed to manage MDT meetings for HCC, ensure correct documentation of meeting outcomes, coordinate patient treatment, communicate with the patient and their family, and liaise with other centres (Wundke et al., 2019). After the introduction of the post, the number of annual referrals increased from 204 to 277 (Wundke et al., 2019).

Dedicated nurse coordinator roles have been shown to be cost-effective in HCC (Ow et al., 2017). Over 1 year, a nurse coordinator contributed to the avoidance of 175 outpatient visits: 113 were through the nurse's independent delivery and initiation of MDT meeting plans, 10 by nurse-led patient education, and 52 by weekly administrative tasks (e.g. e-mails and phone calls) and clinical activities (e.g. retrieval and upload of radiological data performed in the community). The minimum annual cost saving was A$85 750, equating to a net annual saving (after salary deductions) of A$17 050 (Ow et al., 2017). Importantly, no patient dissatisfaction regarding accessibility of medical staff was reported after establishment of the HCC nurse coordinator role (Ow et al., 2017).

Table 1
Overview of included evidence, stratified by study/publication type.

Citation	Disease	Indicator of study size	Aim of study/focus of publication	Key findings on nurse roles
Prospective RCT (n = 1)				
Wang et al., (2019) (Wang et al., 2019)	HCC	136 patients	Comparison of CEC program versus basic care on anxiety, depression, QoL, and survival in patients with HCC who underwent surgical resection	• CEC intervention significantly reduced anxiety (HADS-A score; $p < 0.05$) and depression (HADS-D score; $p < 0.05$) in patients, when compared with control patients • CEC improved QoL, evaluated as an increase in QLQ-C30 global health status ($p < 0.05$) • OS was prolonged after CEC intervention (median OS CEC: 37.0 [27.6–46.4 months]; control group: 32.0 [27.0–37.0 months]; $p = 0.026$)
Prospective cohort studies (n = 10)				
Aberra et al., (2013) (Aberra et al., 2013)	HCC	355 patients	Evaluation of the effectiveness of quality improvement measures for HCC surveillance	• After implementation of a chronic disease management programme, which integrated nursing-based protocols with automatic reminders, 93% of patients had surveillance imaging performed compared with 74% of patients in a previous cohort (before programme introduction) ($p < 0.001$)
Feng et al.	Liver cancer	66 patients	Assessment of predictive nursing in patients with liver cancer	• After implementation of predictive nursing, patients had shorter hospital stays ($p < 0.05$), lower incidence of complications ($p < 0.05$) and higher nursing satisfaction ($p < 0.05$), compared to patients given routine care
Hansen et al., (2017a) (Hansen et al., 2017a)	HCC	18 patients	Longitudinal analysis of symptoms in patients with advanced HCC at end of life	• Nurses play a vital role in providing comprehensive, holistic care based on individual patient needs by facilitating discussions about apparent and less apparent distressing symptoms
Hansen et al., (2017b) (Hansen et al., 2017b)	HCC	13 family caregivers	Longitudinal study of family caregivers of patients with HCC at end of life	• Family caregivers felt unprepared, uncertain and in need of information • Nurses can help by discussing the caregiver's concerns and implementing appropriate strategies to address these • They can also advocate for early referral of patients for palliative care
Li et al., (2015) (Li et al., 2015)	HCC	68 patients	Assessment of the effectiveness of combined TACE and microwave coagulation therapy	• Patients were closely observed and received intensified nursing care during the perioperative period • The authors concluded that this reduced complications, enhanced the therapeutic effect and improved patients' QoL
Pan et al., (2021) (Pan et al., 2021)	Advanced liver cancer	166 patients and their core family members	Evaluation of hospice nursing care (vs usual care) on patients' QoL and pain and on the negative emotions of core family members	• Hospice nursing relieved the degree of pain in in patients and improved their subjective well-being and QoL before death compared with routine care • Hospice nursing reduced the incidence of negative emotions (e.g., anxiety and depression) among core family members and improved satisfaction with nursing care
Pang et al., (2019) (Pang et al., 2019)	HCC	105 patients	Evaluation of the impact of whole-course, high-quality nursing versus routine nursing during radiotherapy	• Scores for ADL and nursing satisfaction were significantly improved ($p < 0.05$), and the incidence of adverse reactions was significantly lower in the high-quality group ($p < 0.05$) • Scores for anxiety and depression improved in both groups
Sun et al., (2008) (Sun et al., 2008)	HCC	22 patients	Assessment of symptom concerns in patients with HCC	• Patients with HCC have lower QoL scores and many symptom concerns; nurses should be aware of these and advocate for effective symptom management
Zhang et al., 2021a (Zhang et al., 2021a)	Advanced liver cancer	68 patients	Assessment of the clinical application value and satisfaction of comfortable nursing for patients with advanced liver cancer undergoing chemotherapy	• Total effective rate of clinical nursing and patient satisfaction was significantly higher in patients receiving comfort nursing compared to the control group ($p < 0.01$ for both) • QoL score was significantly lower in the comfort nursing group ($p < 0.01$)
Zhang et al., 2021a (Zhang et al., 2021b)	HCC	97 patients	Effect of 5A nursing intervention on living quality and self-care efficacy of patients undergoing chemotherapy after HCC carcinoma surgery	• Scores for self-care efficacy ($p < 0.01$) and life quality ($p < 0.01$) were significantly improved following the model of '5A' nursing intervention • The intervention helped to alleviate cancer-related fatigue during treatment ($p < 0.01$), and improve the satisfaction degree of patients with nursing care ($p < 0.01$)
Surveys and interviews (n = 5)				
	HCC			

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Table 1 (*continued*)

Citation	Disease	Indicator of study size	Aim of study/focus of publication	Key findings on nurse roles
Prospective RCT (n = 1)				
Cross et al., (2016) (Cross et al., 2016)		138 respondents: hepatologists, gastroenterologists and nurse specialists	Assessment of attitudes towards, and provision of, ultrasound surveillance in the UK	• Ultrasound surveillance was in place in the hospitals of 134 respondents (97.1%); this was arranged on an *ad hoc* basis in 104 centres (76.0%), by a specialist nurse in 29 (21.0%) and on an automated basis in 3 (2.2%)
Devictor et al. (2021)	HCC	42 French liver cancer centres	Survey to identify the role and responsibilities of nurse coordinators in a cohort of patients with HCC	• Provision of patient information and counselling were common to all nurse co-ordinator roles, but there was wide heterogeneity in the other functions of the co-ordinator role (e.g. care co-ordination, patient support and holistic assessment) across the participating centres
Sheppard-Law et al., (2018) (Sheppard-Law et al., 2018)	HCC	177 patients receiving oral antiviral therapies for hepatitis B	Assessment of screening for HCC	• Strategies to improve HCC screening include nurse-led education of patients receiving treatment for hepatitis B
Wang et al., (2012) (Wang et al., 2012)	HCC	277 patients	Identification of symptom clusters and their impact on QoL in Chinese patients with primary liver cancer	• Three symptom clusters were identified (gastrointestinal sickness, and neuropsychological and liver dysfunction), and factors impacting on their severity were ascertained • Nurses should focus on relieving the primary symptom cluster because this may be cost-effective and improve QoL
Zheng et al., (2013) (Zheng et al., 2013)	HCC	21 nurses	Survey of nurses' experiences of having managed patients with catastrophic upper gastrointestinal bleeding	• Managing these patients had an impact on nurses' personal life, and work and life philosophy • Nursing leaders must ensure that nurses have appropriate skills and education to care for dying patients, and that nurses involved are provided with emotional and psychosocial support
Retrospective analyses (n = 7)				
Brunot et al., (2018) (Brunot et al., 2018)	HCC	129 patients	Impact of a nurse-led educational programme for patients treated with sorafenib	• The nurse-led educational programme consisted of a visit before the first sorafenib administration, weekly telephone calls, and a nurse visit before each oncologist consultation • Compared with usual care, those who received the nurse-led programme had significantly fewer dose reductions ($p = 0.04$), and median time to first dose reduction was significantly shorter ($p = 0.036$)
Gou et al., (2019) (Gou et al., 2019)	HCC	512 patients	Impact of a comprehensive nursing intervention in patients with liver cirrhosis and liver cancer	• Comprehensive care included physiological, psychological, illness treatment and prevention, health promotion and family support (Bulechek and McCloskey, 1995) • Compared with usual nursing care, comprehensive care was associated with significantly improved patient satisfaction ($p < 0.001$), QoL ($p < 0.001$), post-operative complications ($p < 0.001$) and survival rates ($p = 0.035$)
Kennedy et al., (2013) (Kennedy et al., 2013)	HCC	N/A	Audit of ultrasound screening practices before and after introduction of quality improvement measures (improved doctor education, system redesign and improved patient education)	• At baseline, 46% and 0% of patients had appropriate surveillance performed during the previous 6 months and 2 years, respectively • Three years after the introduction of the new measures, the corresponding values were 92% and 64%, respectively
Maher et al., (2021) { Maher et al., 2021 #77}	Liver disease	926 participants	Impact of a community-based screening program designed for early diagnosis and intervention of liver disease and HCC in high-risk groups	• Out of 926 participants screened over a 6-year period, 122 (13.2%) had evidence of chronic liver disease
Nazareth et al., (2016) (Nazareth et al., 2016)	HCC	76 patients with cirrhosis	Assessment of nurse-led HCC surveillance clinic	• Ultrasound appointments were attended within 6 months in 30.3% of cases and within 7 months in 71.2% of cases • 18 patients (24%) were referred for further imaging, and HCC was diagnosed in two patients • Authors concluded that nurse-led HCC surveillance was effective, and that well-defined protocols enabled timely identification of patients with HCC so that management strategies could be implemented without delay
Ow et al., (2017) (Ow et al., 2017)	HCC	N/A	Impact of a dedicated nurse coordinator service in tertiary care	• At least 175 outpatient encounters were spared per year; 113 resulted from MDT meeting plans, 10 were attributed to nurse-led patient education, and 52 were equated to weekly administrative tasks (e.g. e-mails, text messages and phone calls) and clinical activities (e.g. retrieval and upload of

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Table 1 (*continued*)

Citation	Disease	Indicator of study size	Aim of study/focus of publication	Key findings on nurse roles
Prospective RCT (n = 1)				
Shomura et al., (2014) (Shomura et al., 2014)	HCC	37 patients	Evaluation of the relationship among AEs, efficacy and nursing intervention in sorafenib-treated patients with HCC	radiological data performed in the community) undertaken by the HCC nurse coordinator • The minimum annual cost saving was A$85 750; after deduction of the nurse's salary, this equated to a saving of A$17 050 • Patients who received the nursing intervention (education on self-monitoring and AE management, and telephone follow-up) had a median treatment duration of 122 days vs 36 days in those who did not receive the intervention • The nursing intervention was an independent, significant predictor of treatment duration (p = 0.022)
Case studies (n = 6)				
Denz and Jorgenson, 2006 (Denz and Jorgenson, 2006)	HCC	1 patient	Case study illustrating radiological interventions used to treat HCC	• Highlights the role of nurses before, during and after radiological treatments, emphasizing that they should understand disease risk factors, the various treatment options and the possible treatment complications
Hayward et al., (2011) (Hayward et al., 2011)	RCC	1 patient	Management of a patient with RCC and skeletal metastases treated with zoledronic acid	• This complex case is used to illustrate educational and cancer survival issues for the nursing team • The patient's long relationship with the outpatient nursing team, and the benefits of being treated at home despite complex therapies, are highlighted
Hull and Chester, 2008 (Hull and Chester, 2008)	HCC	1 patient	Case study used to illustrate the role of a research nurse in managing a patient with HCC and a poor prognosis in a clinical trial setting	• Nurses make a significant contribution to the MDT when caring for patients participating in clinical trials • Their role includes providing advice, psychological rehabilitation, support, treatment, spiritual care, symptom management and palliative care
Hull and Armstrong, 2010 (Hull and Armstrong, 2010)	HCC	1 patient	Case study used to illustrate the role of an oncology nurse in managing a sorafenib-treated patient with HCC	• Nurses are a key part of the MDT and play an important role in care coordination, assessment and management of AEs, and also in patient education
McCurdy (2013) (McCurdy, 2013)	HCC	1 patient	Case study of a patient with HCC receiving TACE, used to illustrate how patient safety could be improved	• Patient safety could be improved by ensuring trust between doctors and nurses, as well as open and honest communication and collaboration • Nurses should be knowledgeable about all medications administered, including their side effects, as well as the potential complications of TACE • Nurses should play a role in educating caregivers
Zhao et al., (2008) (Zhao et al., 2008)	HCC	1 patient	Case report describing rare pulmonary and cerebral complications after TACE for HCC	• Highlights the role of nurses in patients undergoing TACE, including pre-procedure assessment and patient education, and intervention, in the event of rare pulmonary and cerebral complications
Systematic review (n = 6)				
Bai et al., (2013) (Bai et al., 2013)	HCC	N/A 18 RCTs	Review of clinical interventions to improve QoL in patients with advanced HCC from mainland China	• Comprehensive nurse-led interventions that address multiple QoL dimensions show promise for enhancing clinical outcomes; these include education and psychosocial support, symptom management early in the disease trajectory, and ongoing assessment of physical symptoms, emotional distress and spiritual well-being • Telephone monitoring is feasible • Families should be involved
Bell et al., (2017) (Bell et al., 2017)	General cancer	N/A 56 studies	Hospital readmissions in patients with cancer in the USA	• Readmissions for HCC were among the highest of any cancer • Nurses can play a role in reducing readmission rates via education, medication management, care planning and care coordination
Fan et al., (2010) (Fan et al., 2010)	HCC	N/A 36 studies	QoL in patients with HCC	• There is preliminary evidence that psychosocial interventions (including psychoeducation, relaxation and emotion expression) may reduce negative feelings and enhance QoL vs standard care
Reynolds et al., (2018) (Reynolds et al., 2018)	HCC	N/A 33 studies	Systematic review of quality improvement literature in gastroenterology	• Effective quality improvement interventions included nursing protocols to increase HCC screening (based on data from the Aberra and

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Table 1 (*continued*)

Citation	Disease	Indicator of study size	Aim of study/focus of publication	Key findings on nurse roles
Prospective RCT (n = 1)				
				Kennedy studies) (Aberra et al., 2013; Kennedy et al., 2013)
Tapper (2016) (Tapper, 2016)	HCC	N/A 15 studies	Review of quality improvement programmes for liver disease	• Nurse coordinators have a positive impact on adherence to quality care and HCC screening guidelines (based on data from the Aberra and Kennedy studies) (Aberra et al., 2013; Kennedy et al., 2013)
Zhang et al., 2020b (Zhang et al., 2020b)	HCC	1205 patients 5 studies	Systematic review and meta-analysis on the impact of intense nursing care in improving anxiety, depression, and QoL in patients with liver cancer	• Analysis provides evidence to support the hypothesis that intense nursing care can significantly improve patient QoL, mental health and satisfaction with nursing care
Narrative review (n = 19)				
Arellano (2018) (Arellano, 2018)	RCC	N/A	Review of thermal ablation to treat RCC	• Nurses may be involved in pre-, intra- and post-procedural care in patients receiving thermal ablation
Bourdeanu et al., (2011) (Bourdeanu et al., 2011)	RCC	N/A	Review on nursing considerations for patients with metastatic RCC being treated with pazopanib	• Highlights the role of nurses in counselling patients, and monitoring and managing the side effects of pazopanib treatment
Boyle (2017) (Boyle, 2017)	HCC	N/A	Review of the role of nurses in managing HCC in the Asia–Pacific region	• Discusses the role of nurses in providing education on HCC preventative measures, advocacy for patients with HCC and emotional support for caregivers
Ciccolini et al., (2017) (Ciccolini et al., 2017)	RCC	N/A	Review on role of advanced care providers and nurses in the assessment and management of immunotherapy-related dermatologic AEs	• Highlights that nurses must be knowledgeable about the pathophysiology, incidence, assessment and clinical presentation of dermatologic AEs • Includes a treatment algorithm for the severity assessment and interventions for maculopapular rash, pruritus and vitiligo
Esper (2012) (Esper, 2012)	RCC	N/A	Overview of treatment options for advanced RCC	• Highlights that nurses should be familiar with mechanisms of action, potential AEs and management strategies, and that they should ensure that patients understand the risk, benefits and goals of treatment
Gish et al., (2012) (Gish et al., 2012)	HCC	N/A	Overview of the role of the MDT in the diagnosis and treatment of HCC	• Highlights that nurses play an important role in monitoring patients, assessing the impact of treatment, and helping patients to manage stress and maintain their QoL
Moldawer and Figlin (2008) (Moldawer and Figlin, 2008)	RCC	N/A	Literature-based review of new treatments for RCC and the implications for nursing care	• Highlights the role of nurses in patient education, patient self-management, managing side effects and providing advocacy related to health insurance
Moldawer & Wood (Moldawer and Wood, 2020)	RCC	N/A	Summary of the critical role of the oncology nurse in the management of patients with advanced kidney cancer	• Provides background on the establishment of the critical role of the oncology nurse • Highlights that the evolution of the oncology nurse has made profound contributions in patient care, symptom management, and professional education
Mortimore and Mayes (2019) (Mortimore and Mayes, 2019)	HCC	N/A	Review of ultrasound scans for diagnostic imaging of the liver	• Highlights the role of nurses in supporting the sonographer and ordering ultrasounds (after appropriate training)
Noble and Page (2012) (Noble and Page, 2012)	RCC	N/A	Review of the nurse's role in the prevention and management of RCC	• Nurses can play a role in providing advice on lifestyle changes that may reduce the risk of RCC, and in assessing patients' physical, functional, social and emotional status • Nurses should understand new drug treatments and their side effects
O'Donoghue et al. (2019) (O'Donoghue et al., 2019)	HCC	N/A	Article describing set-up of a nurse-led joint hepatology and oncology clinic	• Clinical nurse specialist was involved in: coordinating MDT meetings; patient triage; pre- and post-meeting communication with the patient; and initiating the treatment pathway • 6 years after introducing the joint clinic, referrals had increased from 30 to 180 per year, and feedback was very positive • Average time from diagnosis to treatment was reduced from 4 months to 1 month or less, and there was a significant increase in the use of all treatment modalities • The clinic has also allowed for more individualized care
Sun and Sarna (2008) (Sun and Sarna, 2008)	HCC	N/A	Review of symptom management in HCC	• Oncology nurses can play an integral role in symptom management in patients with HCC

(*continued on next page*)

Table 1 (*continued*)

Citation	Disease	Indicator of study size	Aim of study/focus of publication	Key findings on nurse roles
Prospective RCT (n = 1)				
				• Nurses should familiarize themselves with guidelines for the management of common cancer symptoms • Symptom management should be individualized based on patient preferences, physical status and disease condition • Nurses can act as advocates to facilitate the communication of symptoms between patients and doctors, and facilitate prompt referral to supportive care experts
Sur and Sharma (2018) (Sur and Sharma, 2018)	HCC	N/A	Review of TACE for HCC	• Nurses can play a role in pre-procedure work-ups, procedural techniques and post-procedure management of patients undergoing TACE
Tarrant et al., 2013 (Tarrant et al., 2013)	HCC	N/A	Guidance for nurses on how to use a published algorithm for hepatitis B screening	• Nurse practitioners play a key role in screening, initial clinical and laboratory evaluation, strategic management, and monitoring the referral of patients with hepatitis B • Use of a published algorithm can help nurse practitioners with these processes
Taylor and Sansivero (2010) (Taylor and Sansivero, 2010)	HCC	N/A	Review of thermal ablation for hepatic malignancies	• Nurses play a role in the pre-, intra- and post-procedural care of patients receiving thermal ablation • This includes prepping the patient, monitoring vital signs, providing oxygen and suction if needed, and, in the post-procedural period, providing appropriate information and follow-up
Tyre and Quan (2007) (Tyre and Quan, 2007)	RCC	N/A	Review of nursing management of patients with metastatic RCC receiving high-dose, continuous-infusion IL-2	• Nurses play a role in the pre-treatment evaluation, inpatient monitoring during treatment, and preparation for discharge • Nursing care is focused on the recognition and management of common side effects
Walko and Grande (2014) (Walko and Grande, 2014)	RCC and HCC	N/A	Review on common side effects of sorafenib	• Patient education, proactive management and open communication within the MDT are critical to the effective management of sorafenib-related AEs
Wundke et al., (2019) (Wundke et al., 2019)	HCC	N/A	Article describing the role of a nurse specializing in chronic liver disease in Australia (follow-up publication to (Kennedy et al., 2013)	• As well as improving adherence to HCC screening protocols (Kennedy et al., 2013), the programme was associated with earlier diagnosis of HCC and a lower mortality compared with patients in the same region who were not covered by the programme • Electronic databases have been vital to the management of the programme, generating weekly ultrasound schedules, documentation of patient notes and rigorous follow-up
Yost et al., (2010) (Yost et al., 2010)	RCC	N/A	Article describing set-up of an IL-2 biotherapy programme in an ICU at a cancer care centre	• Nursing staff were involved in designing the IL-2 treatment plan, which included guidelines for pre-treatment and discharge assessments, and monitoring during treatment • A resource folder was prepared containing information on managing potential complications of treatment • Patients were very satisfied with the higher nurse-to-patient ratio in the ICU and morale among nurses was high
Clinical guidelines and recommendations (n = 2)				
Edmonds et al., (2012) (Edmonds et al., 2012)	RCC and HCC	N/A	Recommendations from a European nursing task group on how to assess and manage AEs of targeted therapies	• Concludes that evidence (particularly from controlled studies) on the management of these AEs is sparse, but recommendations could be made based on the literature and on clinical experience
Richmond et al., (2014) (Richmond et al., 2014)	HCC	N/A	Consensus-based guidelines on nursing care for patients with liver disease	• Includes 19 statements on HCC, which cover surveillance, patient and caregiver education, assistance with active self-management, coordination of care within the MDT, provision of care during treatment, facilitation of referrals, and provision of ongoing education and support, for other healthcare professionals managing patients with HCC

ADL = activities of daily living; AE = adverse event; CEC = comprehensive education and care; HCC = hepatocellular carcinoma; ICU = intensive care unit; IL-2 = interleukin-2; MDT = multidisciplinary team; N/A = not applicable; QLQ – quality of life questionnaire; QoL = quality of life; RCC = renal cell carcinoma; RCT, randomized controlled trial; TACE = transarterial chemoembolization.

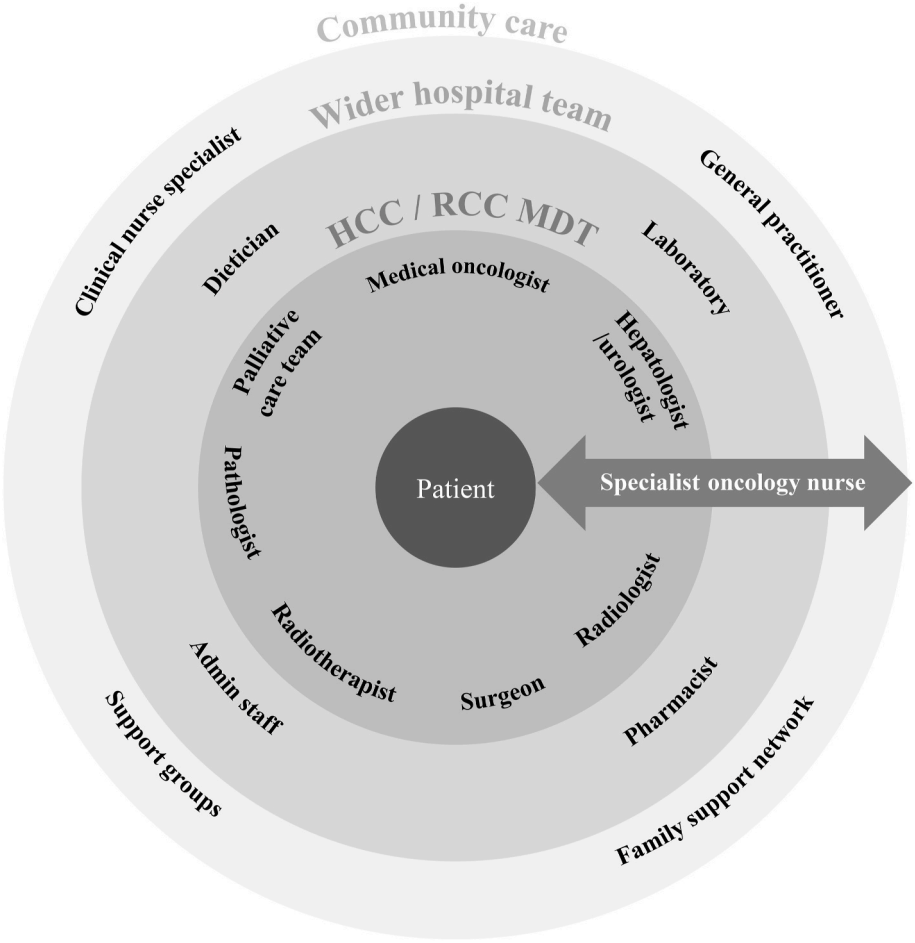


Fig. 2. The multidisciplinary team (MDT) and wider ancillary and community-based care teams involved in the management of patients with hepatocellular carcinoma (HCC) and renal cell carcinoma (RCC).

3.3. Rapport and emotional support

Patients with cancer can be expected to experience some psychosocial distress as a result of their condition and treatment. This distress can diminish patients' quality of life (QoL) and contribute to suboptimal medication adherence, which in turn can negatively impact treatment outcomes (McCarter et al., 2018). Cancer can also have a negative impact on the psychological well-being of patients' families and carers (Northouse et al., 2012).

As the primary point of contact for many patients with HCC or RCC and their caregivers, oncology nurses are ideally positioned to assess the psychological health of patients and their loved ones, and to help provide tailored emotional support (Boyle, 2017; Gish et al., 2012; Noble and Page, 2012). A good rapport between nursing professionals, patients and their caregivers is key to providing such support (Moldawer and Figlin, 2008). In a case report of a patient with RCC and skeletal metastases (Hayward et al., 2011), for example, the patient maintained a good QoL and managed their overall level of anxiety through the continued support of their HCPs and their long-term relationship with their clinical nurse specialist despite the complexities of their care pathway and fluctuating care needs (Hayward et al., 2011). Further, an evaluation of hospice nursing care compared with routine care of patients with advanced liver cancer (n = 166) found that hospice nursing care offered benefits in terms of patients' pain management and QoL prior to death, and in the provision of education and counselling to core family members and to their overall satisfaction with nursing (Pan et al., 2021).

A systematic review involving 36 HCC studies suggested that psychosocial interventions (e.g. relaxation and emotion expression) may have the potential to improve patients' QoL (Fan et al., 2010). A comprehensive literature review (18 RCTs, 3 conducted in mainland China) to identify effective QoL interventions in patients with HCC in China also found that nurse-led, home-based interventions addressing multiple QoL dimensions may achieve positive results; these interventions included focus on education and psychosocial support, symptom management early in the disease trajectory, and ongoing assessment of physical symptoms, emotional distress and spiritual well-being (Bai et al., 2013). The authors of the review also recommended that families are engaged in nurse-led QoL interventions (Bai et al., 2013).

Regarding end-of-life care, managing patients with late-stage disease can have a substantial emotional impact on nurses and caregivers. A survey of nurses (n = 21) who had taken care of patients with HCC and catastrophic gastrointestinal bleeding found that the experience had affected respondents' personal lives, work and 'life philosophy' (Zheng et al., 2013). The survey authors recommended that nurses receive training to improve their coping skills, education on care of the dying, and support for their own psychosocial health. When end-of-life care is provided by the family or caregiver, a longitudinal study involving 13 family caregivers showed found that nurses can still play an important role in helping to ensure timely referral for palliation to optimize the management of patients' pain, symptoms and QoL (Hansen et al., 2017b).

3.4. Education

The educational potential of the oncology nurse's role is multifaceted. After initial diagnosis, nurses can assess and address patients' and caregivers' educational needs and their readiness to learn about the disease course and available treatment options (Moldawer and Figlin, 2008; Moldawer and Wood, 2020). Validated assessment tools can help provide a framework to assist nurses in initiating such educational conversations (Moldawer and Figlin, 2008). The Functional Assessment of Cancer Therapy (FACT) Kidney Symptom Index, for example, evaluates physical and psychosocial concerns identified by patients with RCC and cancer researchers, such as fear of disease progression, losing hope and difficulties with family life (Moldawer and Figlin, 2008), and may provide a platform for prompting related discussions. In the case of RCC, because it is so rare, initial conversations may focus on the different staging criteria and the options for managing local versus metastatic disease (Moldawer and Figlin, 2008).

Pre-treatment nurse-led education can ensure that patients have a clear understanding of the goals and potential for AEs, which can help them (and their caregivers) to prepare and take part in collaborative care discussions (Esper, 2012).

During procedural interventions (e.g. thermal ablation and radiological interventions) and treatment, oncology nurses play an important role in educating patients and managing their expectations, and in delivery and monitoring of care (Arellano, 2018; Denz and Jorgenson, 2006; Sur and Sharma, 2018; Taylor and Sansivero, 2010). Nurse-led education during patients' hospitalization can help to prepare them for discharge, in areas such as advising of potential complications, assisting with medication management, supporting care planning and coordination, and facilitating the transition to community care (Bell et al., 2017). Pre-discharge education is particularly pertinent in HCC, which has among the highest rates of readmission of all cancers (Bell et al., 2017).

At all stages of the care pathway, it is important that education is tailored to match patients' cultural, cognitive and emotional needs; success stories can be effective aids during coaching interventions (Moldawer and Figlin, 2008). It may also be appropriate to connect individuals with other patients (subject to their permission) or to direct patients and their families to national support groups (Moldawer and Figlin, 2008).

3.5. Promotion of self-management

The emergence of oral treatments for RCC and HCC (Boland and Wu, 2018) has increased the potential for patients to self-administer therapy at home (Moldawer and Figlin, 2008; Peng and Wu, 2020). Home (vs hospital-based) administration poses less disruption to patients' daily lives (Moldawer and Figlin, 2008), but also places greater responsibility on patients to adhere to their prescribed regimen and be alert for AEs. Nurses can support patients in self-management, by reinforcing self-administration techniques, providing tools and written instructions for complicated regimens, reviewing diaries to check medication adherence, and offering telephone follow-up and monitoring (Bourdeanu et al., 2011; Moldawer and Figlin, 2008). Facilitating optimum adherence to cancer treatment is vital because non-adherence can reduce survival and increase recurrence and healthcare costs (Puts et al., 2014). A recent study assessing a novel self-management-based model of nursing care (the 5A model) in a cohort of 97 patients with HCC found that the 5A model significantly improved self-care efficacy and QoL compared with conventional care. The model was also associated with an alleviation of cancer-related fatigue during treatment, and an improvement in patients' satisfaction with their nursing care (Zhang et al., 2021b).

3.6. Symptom and adverse event monitoring and management

Patients with RCC and HCC will experience a range of physical and psychological symptoms that can impair QoL (Hansen et al., 2017a; Rao et al., 2009; Sun et al., 2008). QoL often declines as the disease progresses, and as a result of treatment-related morbidities (Sun et al., 2008) that often occur towards the end of life. Thus, effective symptom management is key to preserving patients' functional status and QoL, particularly in those with unresectable disease (Sun and Sarna, 2008). Oncology nurses can provide patient counselling and education on disease-related symptoms, and ensure early and timely communication of symptoms and referral to relevant supportive care services (Sun and Sarna, 2008). Nurses should be familiar with evidence-based guidelines for the management of common symptoms, and know how to tailor approaches to individual patients' preferences, physical status and disease condition (Sun and Sarna, 2008). A multidisciplinary model of care is ultimately advised, with the team working proactively to care for the symptom needs of patients (Sun and Sarna, 2008).

There are also a number of treatment-related adverse events that it is important for patients with RCC and HCC treatments to be aware of so that they can be empowered to monitor and manage any emergent events. If these are not anticipated by patients, or are poorly managed by their doctors and carers, they can contribute to drug discontinuation, reduced QoL and suboptimal outcomes (Brunot et al., 2018; Sun et al., 2008; Tyre and Quan, 2007). The role of nurses in AE management and the implications for treatment adherence have been recognized in both RCC and HCC (Bourdeanu et al., 2011; Gish et al., 2012). Anticipation, recognition, and timely and appropriate management of AEs (including specialist referral if necessary) have the potential to improve patient outcomes (Ciccolini et al., 2017; Hull and Armstrong, 2010; Tyre and Quan, 2007; Walko and Grande, 2014).

During treatment, it may be necessary to check for drug interactions and to modify concomitant medications (Bourdeanu et al., 2011; Hull and Armstrong, 2010). Nurses can assess patients' (and caregivers') understanding of potential treatment-related AEs and reaffirm the importance of tracking and reporting them (Hull and Armstrong, 2010; Moldawer and Figlin, 2008). Providing patients with an information sheet at discharge may be useful in this context (Tyre and Quan, 2007).

The range of potential treatment-related AEs and the rapidly evolving therapeutic landscapes for HCC and RCC can make optimal AE management challenging. Oncology nurses must keep up to date with the latest advances in the field, including the pathophysiology, incidence, assessment and clinical presentation of AEs (Bourdeanu et al., 2011; Ciccolini et al., 2017; Esper, 2012; Moldawer and Figlin, 2008; Moldawer and Wood, 2020; Tyre and Quan, 2007). Various papers have been published on nurse-led management of AEs with RCC and HCC treatments; these include recommendations from a European nursing task group on managing the side effects of targeted therapies (Edmonds et al., 2012), and the management of dermatologic side effects of immunotherapies for advanced RCC (Ciccolini et al., 2017). They also include specific papers on the use of sorafenib for advanced RCC and HCC (Hull and Armstrong, 2010; Walko and Grande, 2014), pazopanib for metastatic RCC (Bourdeanu et al., 2011) and high-dose interleukin-2 therapy for RCC (Tyre and Quan, 2007; Yost et al., 2010). Resolution of some difficult-to-manage AEs (e.g. diarrhoea, fatigue) also relies on the experience of oncology nurses and the wider care team (Edmonds et al., 2012).

The role of the nurse in recognizing and managing AEs not only relates to potential toxicities associated with targeted therapies, but also to the identification of rare AEs, such as pulmonary and cerebral complications, as reported in published case reports (Zhao et al., 2008) and, in HCC, severe gastrointestinal sickness symptom cluster after transarterial chemoembolization (TACE), as reported by questionnaire-based studies (n = 277) (Wang et al., 2012). The nurse's role in protecting the safety of patients receiving TACE is well recognized, and the importance of trust and good communication among all members of the healthcare team has

been emphasized in the literature (McCurdy, 2013). In a study of patients receiving combined TACE and microwave coagulation therapy, intensified nursing during the perioperative period was associated with reduced complications, as well as an enhanced therapeutic effect and improvement in patients' QoL (Li et al., 2015).

Timely and frequent communication between patients and nurses can facilitate prompt AE reporting and support patients in their overall treatment decisions (Hull and Armstrong, 2010). A nurse-led telephone-based intervention to support patient self-monitoring and AE management was shown to improve treatment adherence in patients with HCC (n = 37) (Shomura et al., 2014). Patients receiving oncology nurse follow-up calls had an average treatment duration of 122 days compared with only 36 days in patients receiving no nursing support. In a separate nurse-led intervention study, telephone follow-up improved treatment outcomes in patients with HCC (n = 129) through timely identification and management of sorafenib-related toxicities (Brunot et al., 2018). Patients receiving the nursing follow-up also had fewer overall dose reductions and prompter implementation of necessary dose reductions.

3.7. Holistic support

As critical members of MDTs delivering care for patients with RCC and HCC, nurses are involved throughout the care pathway and, when compared with other HCPs, often spend most time in direct contact with patients. Nurses are therefore well positioned to provide holistic oversight and improve overall care (Gish et al., 2012).

The Australasian Hepatology Association has developed 90 consensus-based guideline statements for the nursing care of patients with liver disease (Richmond et al., 2014). Nineteen of the 90 statements were HCC-specific and support the holistic role of nurses, covering: surveillance; patient and caregiver education; assistance with active self-management; coordination of care within the MDT; provision of care during treatment; facilitation of referrals; and provision of ongoing education and support for other HCPs involved in managing patients with HCC (Richmond et al., 2014).

In a study of 'comprehensive' versus 'conventional' nursing care in over five hundred patients with liver cirrhosis and HCC, comprehensive nursing management was associated with significant improvements in satisfaction, QoL, post-operative complications (each $p < 0.001$) and survival rates ($p = 0.035$) (Gou et al., 2019). Comprehensive care was conducted according to the 2013 Operation Guide for Comprehensive Nursing Care, which includes physiological and psychological care, illness treatment and prevention, health promotion and family support (Bulechek and McCloskey, 1995). In another study in patients undergoing radiotherapy for HCC (n = 105), 'whole-course, high-quality' nursing care was associated with significantly greater patient satisfaction, lower anxiety and depression scores, and fewer adverse reactions (all $p < 0.05$) than 'routine care' (Pang et al., 2019). A separate study evaluated the ability of predictive nursing care, a systematic and standardized intervention, to prevent complications (compared with routine care) in patients with liver cancer (n = 66). Implementation of the approach had a beneficial effect on patients' urination time, pain disappearance time, duration of hospital stays, and also reduced the incidence of complications and improved patients' nursing satisfaction (all $p < 0.05$) (Feng et al., 2021). "Comfortable nursing", an enhanced role involving the provision of targeted psychological counselling, and more considerate pain management, ward aesthetics (e.g. use of plants and flowers) and dietary counselling, was shown to improve QoL and satisfaction with the nursing service (versus usual care) in a cohort of patients with HCC (n = 68) (Zhang et al., 2021a).

In the clinical trial setting, clinical research nurses also address patients' holistic needs by providing support and advice, treatment, psychological rehabilitation, spiritual care, symptom management and palliative care (Hull and Chester, 2008). A randomized clinical trial comparing a comprehensive education and care program with basic care in patients with HCC who underwent surgical resection (n = 136) found that the program significantly reduced incidence (although not severity) of anxiety ($p = 0.024$) among patients, improved their QoL ($p < 0.05$) and prolonged overall survival ($p = 0.026$) (Wang et al., 2019).

A recent systematic review of 5 liver cancer studies also concluded that intensive nursing care can significantly improve patients' mental health (anxiety and depression) and improve both their QoL and satisfaction with their QoL. The authors also acknowledged the limited number of original research articles evaluating nursing care in patients with liver cancers and the need for further, larger studies to confirm their findings (Zhang et al., 2020a).

Ultimately, the provision of comprehensive holistic care should be based on individual patient needs, taking into consideration symptoms that the patient finds especially distressing and that may not be immediately apparent, such as possible sexual dysfunction in patients with HCC (Hansen et al., 2017a).

4. Discussion

There is broad agreement within the published peer-reviewed literature about the benefit that nurses can offer to patient care through their varied roles within HCC and RCC MDTs (Fig. 2). This conclusion, however, is based on reasonably limited data and on a body of literature that is heavily weighted towards HCC over RCC, and biased towards narrative reviews and expert opinion over empirical studies (Table 1). Some of the older papers in this review illustrate how awareness of the value of nursing interventions has grown over recent years, and how practice has evolved to offer a more integrated, multi-disciplinary approach. Best practice guidelines now better reflect patients' holistic care needs and offer clear guidance on early intervention and referral to supportive care services (National Institute for Health and Care Excellence, 2015).

The inclusive nature of the present review, including empirical evaluations, clinical descriptions and/or narrative comments of the impact of nurses in the care of patients with HCC and RCC could be viewed as a limitation of the review. The approach was taken in anticipation of limited available evidence from nursing care evaluations in populations with these tumour types. As such, the robustness of the findings should be interpreted with caution and the results of (for example) case reports and retrospective studies considered as hypothesis generating. With these caveats, the data from the individual HCC studies included demonstrated the benefit of nursing interventions in terms of: improved participation in screening programmes; reduced time to diagnosis; improved treatment adherence, survival and QoL; reduced treatment complications, dose reductions and outpatient visits; and the potential for cost savings (Aberra et al., 2013; Brunot et al., 2018; Kennedy et al., 2013; Nazareth et al., 2016; O'Donoghue et al., 2019; Ow et al., 2017; Pang et al., 2019; Wundke et al., 2019). These findings were mainly based on the results of retrospective analyses and historical cohorts, but one randomized controlled trial in patients with HCC also demonstrated significant benefit from a nursing-led comprehensive education and care program in terms of patients' QoL, mental health and overall survival (Wang et al., 2019).

It is also noteworthy that there are several studies evaluating nurse-led interventions targeted at AE management (n = 10) and screening and surveillance programmes (n = 6) in RCC and HCC (Table 1). Yet there is little evidence to guide nurses in the provision of optimum emotional and psychological support (Fan et al., 2010) or the education of patients with HCC or RCC in self-management. This review found no explicit evidence that a holistic nursing role reflects best practice, although the experience of the authors (coupled with available evidence demonstrating the benefit of nurse-led interventions across multiple stages of the care pathway) suggests that this is likely. Inferential evidence to support this assertion is available from two studies; one which demonstrated that incorporation of a nurse coordinator within the HCC care pathway could reduce the centre's outpatient burden and related

costs (Ow et al., 2017), and a second which demonstrated that appointing dedicated nurses empowered to coordinate directed aspects of HCC care could achieve near-perfect implementation of quality care guidelines (Tapper, 2016).

Overall, this review confirms a paucity of evidence to guide optimized nurse-led care practices in RCC and HCC and an overall lack of prioritization, and possibly recognition, of the value of nurse-led interventions in HCC and (more notably) in RCC. Indeed, it is widely acknowledged that more rigorous studies on the effectiveness of specialist nurse interventions are now required across all types of cancer (Hussain Rawther et al., 2020). This sentiment is further illustrated by a recent Delphi process to build consensus among specialists on research needs in liver disorders (Gurusamy et al., 2019). The 'top 10' research questions generated did not include any nurse-led interventions for patients with HCC (or other liver disorders), suggesting a notable lack of recognition of the centrality of the nurse's role.

The lack of published evidence to guide nursing practices in RCC and HCC does not diminish the daily demands on nurses caring for patients with these conditions, nor does it reduce the scope or importance of the work they do. It may, however, serve as an impediment to optimization of care, and as a barrier to standardization of practices and to advancement of the oncology nursing role across different centres and countries. Without an evidence-based framework for nurses working in RCC and HCC, local care practices must be devised by individual nurses in their local centres, giving rise to variations in care. Without evidence on which to build consensus, including appropriate consideration of patient reported outcomes, practice may risk being less effective than it might be (Kerrigan et al., 2020).

5. Conclusion

The oncology nurse is uniquely positioned to play a critical role across the RCC and HCC care pathways, from proactive roles in health promotion, screening and early detection to providing education and support, and appropriate interventions throughout diagnosis and management. As the professional who will have the greatest contact with patients throughout their treatment, nurses are in the position to provide holistic support and ensure continuity for patients as they are referred to other specialists, and from diagnosis through the different phases of treatment and recovery, or palliative care.

The role and potential benefits of nurse-led interventions in RCC and HCC may be recognized among practising oncology nurse clinicians, but evidence-based practice guidelines remain limited. There is a need for more robust evaluation of the impact of nurse-led interventions on a wider range of clinical outcomes, particularly agreed endpoints such as patient satisfaction, quality of life and survival. Additional corroborative studies in a range of care settings would also be welcomed to confirm the external validity of novel interventions with potential benefit. Furthermore, it is important to address the apparent dearth of nursing interventions available in RCC.

The current disconnect between clinical practice demands and evidence-based interventions should be addressed to ensure that oncology nurses can draw on empirically-derived guidance to provide high-quality care, and ensure that nursing interventions and models of care are optimized for the benefit of patients with RCC and HCC.

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Authors contributions

Daniel Kelly: Conceptualization, Methodology, Writing – Review & Editing, Visualization, Supervision. Paz Fernández-Ortega: Methodology, Writing – Reviewing & Editing, Visualization. Eugenia Trigoso Arjona: Methodology, Writing – Reviewing & Editing, Visualization. Bruno Daniele: Methodology, Writing – Reviewing & Editing, Visualization.

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Appendix A. Supplementary data

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