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ORIGINAL ARTICLE

Haematological malignancies during pregnancy: a systematic review of necessary services in the Australian context

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Abstract

Background: Haematological malignancies diagnosed during pregnancy are rare, with increasing incidence, presenting unique therapeutic, social and ethical challenges for treating teams, patients and their family. There are no national guidelines regarding appropriate referral pathways, resources and services for the management of these patients.
Aims: To conduct a systematic review of the literature to identify the multidisciplinary team members required for optimal care of pregnant patients with haematological malignancies. These data will be used to evaluate the capabilities of Australian health networks to provide coordinated care.
Methods: A systematic review of the literature in MEDLINE and SCOPUS databases was conducted. Eligible studies focused on pregnant Australian patients with haematological malignancies, exploring care models, specialist teams and services utilised. This was then used to generate a map of Australian hospitals that can service this patient demographic.
Results: Essential team members include haematologists, maternal–fetal medicine specialists, anaesthetists, midwives, intensive care specialists, psychologists and social workers. Services utilised include haematology, maternity, intensive care, tertiary imaging, operating theatre, pharmacy and perinatal mental health services. Utilising these data, 25 hospitals can manage these patients.
Conclusions: This study identified the necessary healthcare practitioners, services and hospitals available that can manage this patient cohort. Future research should focus on determining ideal treatment regimens, timing of therapy throughout gestation, establishing a national patient registry and implementing a cancer care plan and frameworks for best practice care. A centralised referral pathway leveraging telehealth will allow expedient, multidisciplinary action and equity in access to all women across Australia.

Introduction

The diagnosis of a haematological malignancy during pregnancy is rare, occurring in approximately one in

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6000 pregnancies, with this number expected to rise due to an increased incidence of cancer and increase in average childbearing age.[1–3] Cancer during pregnancy is a physically and emotionally challenging event for the patient and their family and poses unique therapeutic, social and ethical dilemmas where both the well-being of parent and child must be considered.

Pregnancy-associated Hodgkin lymphoma (HL) accounts for approximately 6% of pregnancy-associated cancers, followed by non-Hodgkin lymphoma (NHL) in approximately 5%.[4] Leukaemia and myeloma are rarer, representing approximately 4% and 0.1% of pregnancy-associated cancers respectively.[2,5,6] The symptoms of haematological malignancies can be incorrectly interpreted as normal physiological changes that occur during pregnancy.[7] There is a lack of literature on how to differentiate symptoms of pregnancy from the clinical signs of an underlying malignancy.[8] There may be overlap or coexistence of symptoms, resulting in delays in diagnosis. As a result, diagnosis is frequently delayed.[3,9] Furthermore, malignancy during pregnancy is associated with increased risks of peripartum complications which may further obscure the underlying diagnosis of malignancy.[10,11]

There are very limited prospective data available to guide the decision-making of clinicians.[8,12] Current recommendations for management are based on case studies, retrospective cohort studies and expert opinion and focused on optimally treating the maternal malignancy while reducing the risks where possible to the foetus/neonate.[10,13–15] Furthermore, there are limited data regarding crucial factors such as the ideal timing of therapy, optimal drug dosing, supportive care and future fertility.[8,16] Moreover, compared to other common cancers during pregnancy, haematological malignancies often require urgent therapy due to acute presentations.[17]

A multidisciplinary approach is essential to obtain the best outcomes for patients with cancer.[18,19] Multidisciplinary teams (MDTs) provide individualised, informed therapeutic options, improve service coordination, accelerate referrals and implement core services.[20] MDTs are the cornerstone for the management of cancer and are increasingly being used in all areas of the medical field.[21] However, some challenges come with mobilising MDTs for the management of a cancer diagnosis in pregnancy. These include a lack of professional training in a multidisciplinary approach for this patient cohort, logistical problems such as location, available meeting times, resources available, financial factors, differing reporting requirements between disciplines, professional autonomy and legislative frameworks that limit the scope of professional practice.[22] Therefore, referral pathways to specialised MDTs for haematological malignancies in pregnancy are not established, and access to these services vary depending on location or health service. This study aims to conduct a systematic review of the literature to identify MDT members needed to deliver care to pregnant patients with haematological malignancies and identify health networks that possess facilities that could manage these patients to provide coordinated care in Australia.

Methods

Information sources and study selection

We conducted a systematic search of MEDLINE and SCOPUS databases for literature published between January 2009 and December 2022. Any review articles, case studies, research reports and articles in English were included. Citations within relevant articles were also examined for consideration in this review. Full-text articles were retrieved and assessed against the eligibility criteria. The full search strategy is in Appendix I.

Eligibility criteria

Studies must focus on pregnant patients diagnosed with any type of haematological malignancy. Included studies must explore any model of multidisciplinary care for these patients, specifically those describing the composition of specialist teams and their roles and responsibilities. The primary outcomes of interest are recommendations, guidelines or descriptions of optimal specialist team composition, as well as the healthcare services used during the management of this patient population.

Quality assessment

The quality of included studies was assessed using the checklists from the Joanna Briggs Institute recommendations for assessing case studies, case series and cross-sectional studies.[23–25]

Data collection process

A standardised data extraction form was developed to synthesise recommendations for the optimal specialist composition of MDTs, as well as services utilised during patient care. The data were collated, and qualitative analysis was performed, highlighting common themes and any variations in recommendations.

Mapping Australian specialist services

Australian hospital service data were obtained from relevant government websites, policy documents, audit reports

and hospital websites. Level 6 maternity public and private health care facilities, according to the Royal Australian and New Zealand College of Obstetricians and Gynaecologists are those that can provide care for all women regardless of clinical risk with the highest level of staffing (midwives, specialist obstetricians and subspecialist services, physician, genetics, specialist haematology) and resources (collaborative care is provided by midwives, junior medical officers, obstetricians, maternal–foetal medicine (MFM) specialists and neonatologists). A list of Australian centres with this classification was identified, then the most subspecialised medical discipline from the analysis, MFM, was used to expand the list by examining the hospitals these specialists serviced. A MFM specialist is an obstetrician who has undergone additional, specialised training and qualifications to manage high-risk pregnancies, offering expertise in the management of complex maternal and fetal conditions. Each hospital was subsequently analysed for further services that were found to be required from the systematic review, including access to a neonatal intensive care unit (NICU), a cancer centre with specialist malignant haematology and adult intensive care. These hospitals were then geographically plotted on a map of Australia (Fig. 3).

Results

A total of 44 articles out of 201 screened articles met the eligibility criteria (Fig. 1). Of the 44 articles included, 17 (39%) were review articles and 27 (61%) were case studies or case series.

In the 27 case studies and case series included, there were a total of 36 patients included. In this patient cohort, the median age was 32 years (range: 20–44), and the median gestational age at diagnosis was 24.5 weeks (range: 5–38). Diagnoses occurred most frequently during the second trimester (16 patients), followed by the third (12 patients) and first (eight patients) trimesters. The most common malignancy types were NHL (42%) and leukaemia (36%), while HL and myeloma accounted for 19% and 3% of diagnoses respectively (Appendix II Table 1).

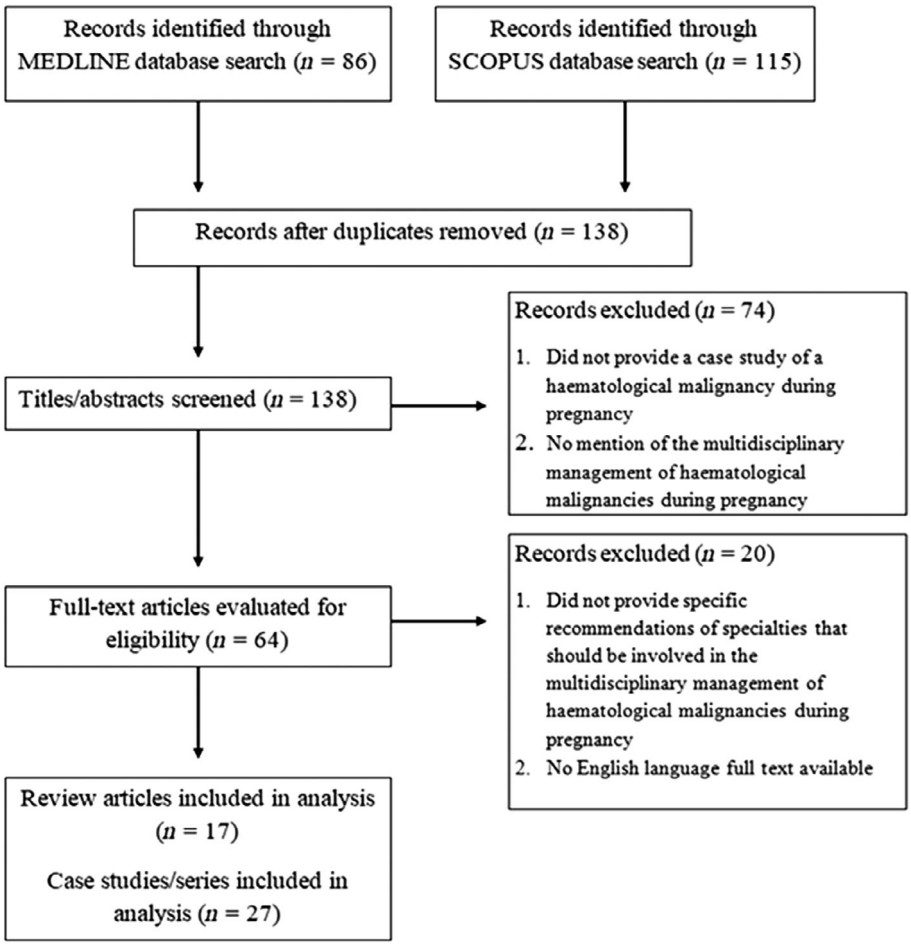

Figure 1 PRISMA flow diagram outlining methodology for article selection.

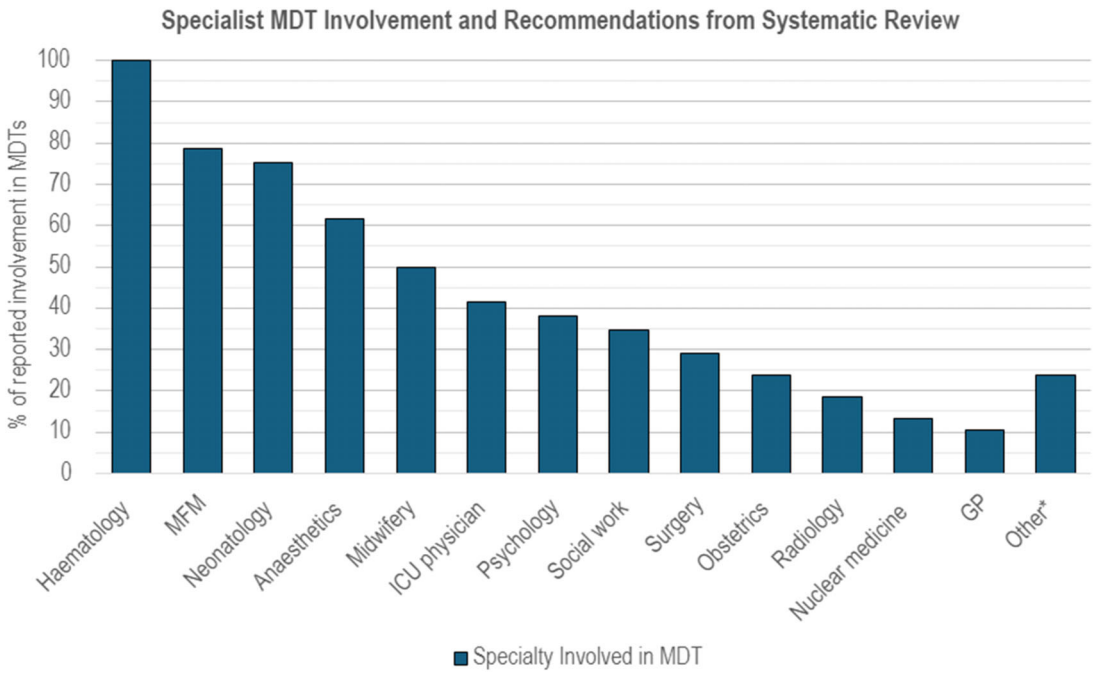

Figure 2 Percentage of multidisciplinary team involvement and recommendation from articles analysed in the systematic review. GP, general practitioner; ICU, intensive care unit; MFM, maternal–foetal medicine. Other* includes specialties that were only mentioned in a single article and include radiation oncology, pharmacy, pathology, geneticist, nephrology, gastroenterology, cardiology, teratogenicity specialist, and reproductive cryobiology.

In the 44 articles, 25 unique specialists from medical, allied health and nursing were mentioned. Figure 2 is a graphical representation of the dataset distribution from all articles. The 'other' category includes specialties that were only mentioned in a single article and include radiation oncology, pharmacy, pathology, geneticist, nephrology, gastroenterology, cardiology, teratogenicity specialist and reproductive cryobiology.

Haematology was identified as the cornerstone of these complex cases, being involved in 100% of the MDTs involved in the care of pregnant patients with a haematological malignancy. MFM were involved or recommended in 34 articles (79%) and obstetrics in 17 articles (38%). Neonatology was the next most frequently acknowledged specialty occurring in 33 articles (75%). Anaesthetics and surgical subspecialties were recommended or involved in 27 (61%) and 11 (25%) articles respectively. An ICU physician was involved in the MDT in 17 (39%) cases. Midwifery and nursing staff were mentioned in 21 (48%) articles. Allied health staff such as psychologists and social workers were involved in 15 (34%) and 14 (32%) MDTs respectively. Radiology and nuclear medicine were mentioned as being integral in eight (18%) and six (13%) articles respectively. Finally, the patient's general practitioner participated in only two (5%) of the MDTs.

Specific service utilisation was extracted and analysed. Haematology and maternity services were most utilised. Intensive care services (ICU and NICU) were involved in 48% of cases. Tertiary imaging and theatre services were also found to be required, being mentioned as crucial in 20 (45%) and 30 (68%) articles respectively. As 58% of patients required antenatal chemotherapy and 78% of mothers required postnatal chemotherapy, pharmacy services were also required in 22 (50%) papers. Finally, dedicated perinatal mental health services were utilised in 10 (23%) cases. From these data, a total of 25 hospitals in Australia were identified as having the potential capability to manage pregnant patients with a haematological malignancy (Fig. 3).

Discussion

Haematological malignancies are potentially curable diseases with generally favourable outcomes for both the mother and her child. A tailored treatment approach is essential, considering patient values, disease factors, therapeutic options, foetal/neonatal risks, future fertility concerns and the patient's support network. Support for the wider family is essential, acknowledging their role as caregivers and ensuring they receive appropriate information, resources and emotional support to navigate this

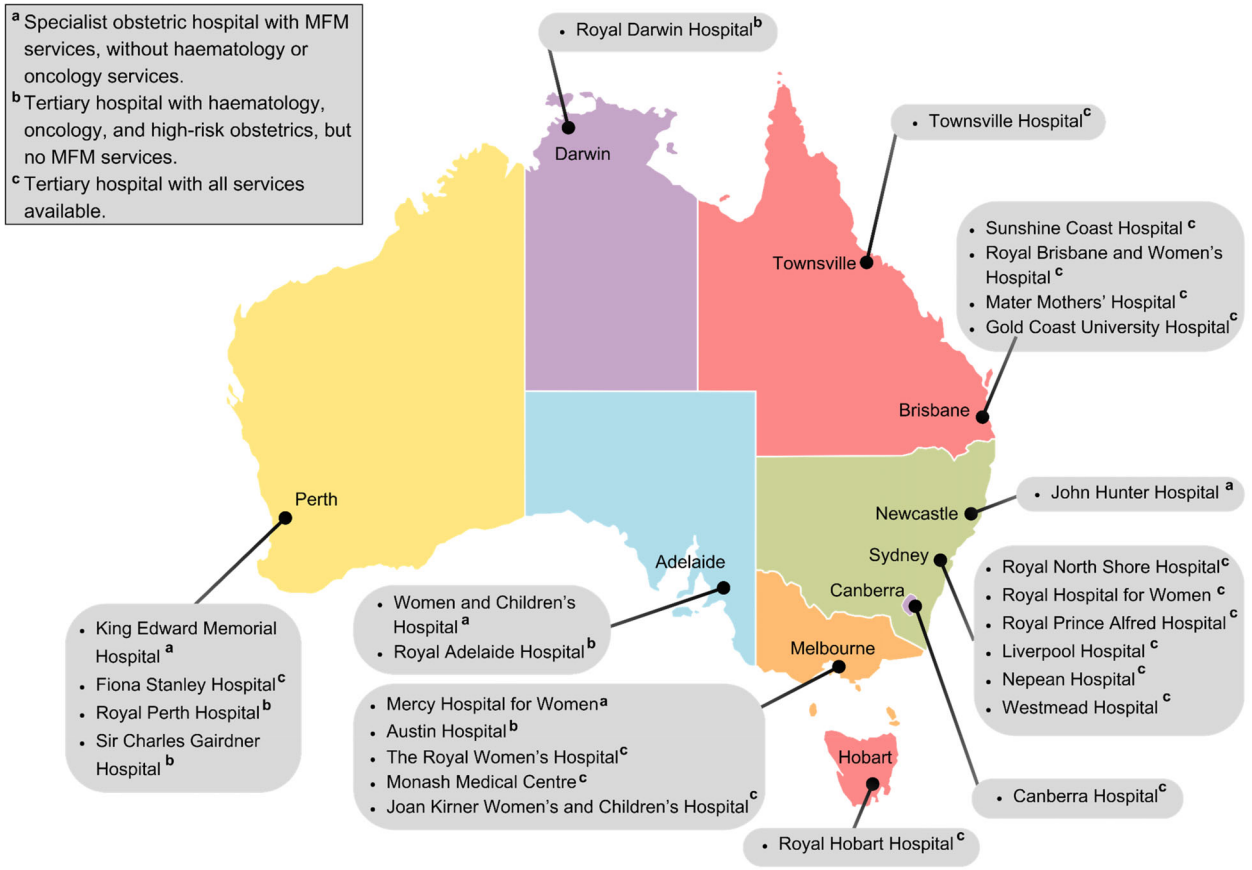

Figure 3 Geographical map highlighting the hospitals having the appropriate resources to manage pregnant patients diagnosed with a haematological malignancy. [a]Only manages the antenatal care and delivery in patients with haematological malignancies. These sites require patients to have their treatment at a nearby cancer centre that is not co-located with the specialist obstetric hospital. [b]Can manage the treatment of pregnant patients with haematological malignancies but require the antenatal care and delivery to be managed at a nearby specialist obstetric hospital with MFM services. [c]Tertiary centres offering comprehensive care for these patients, including treatment, antenatal care and delivery, all in one location.

challenging period alongside the patient. An expert-led MDT must encompass all aspects of care, including social and psychological support, by working closely with other relevant hospital services to develop and implement a personalised management plan.[20,52]

A recent study by the Australian Lymphoma Alliance captured the lived experiences of women diagnosed with lymphoma during pregnancy.[52] This study found that over half of the women experienced communication breakdown between health practitioners and patients. Participants also felt there was a lack of sensitivity in discussions about fertility preservation, teratogenicity of treatment, termination of pregnancy and recommendations for avoidance or cessation of breastfeeding. Rarely were psychology and social work involved in the multidisciplinary care of these patients.[52] A study conducted by Mills *et al*. revealed that women diagnosed with lymphoma expressed a need for discussions regarding oncofertility. The study found that up to 45% of the interviewed patients felt such discussions were absent, and up to 31% expressed concerns about the lack of conversation surrounding the teratogenic effects of treatment.[52] In Australia, oncofertility services are Medicare rebated, with no out-of-pocket costs,[53] which highlights the potential for greater utilisation of these services to address the unmet needs identified in the study. Similarly, in NSW there is also a free teratology service called MotherSafe that is based at the Royal Hospital for Women in Randwick and provides information and counselling on the effects of various exposures on a pregnant woman or her breastfeeding baby. It is evident from the results of this study and the data obtained from the systematic review that there is a focus on relevant medical specialties with less emphasis on allied health input, which are generally acknowledged as necessary for the provision of holistic patient care.[52] This highlights

the necessity for multidisciplinary input, not just from medical professionals, but also from allied health and midwives providing continuity of care, support, advocacy and care coordination.

The multidisciplinary care of this complex patient group requires specialists from varying departments who may not usually work together, bringing their unique expertise and knowledge to optimise outcomes. Coordination of MDTs that function cohesively is important for rapid mobilisation in these rare occurrences. In addition, given the rarity of these clinical presentations and clinical complexity, consultation with other specialists with experience outside those centres may also be required. Virtual MDTs have increasingly been used since the COVID-19 pandemic and can overcome the logistical limitations surrounding face-to-face meetings. Implementation of a centralised referral pathway, as well as virtual teams, would allow for enhanced and expanded service delivery between patients and clinicians, as well as improved cost-effectiveness, convenience, infection control and interdisciplinary collaboration, particularly between different sites.[54] Examining Figure 3, all of these hospitals are located in the population-dense major cities of Australia. Australia's vast geographic size, coupled with the clustering of major hospitals in populated urban centres, the challenge of accessing the necessary specialist medical services is compounded in regional, rural and remote areas.[55] It is important to acknowledge that the coordination of care differs across states. For instance, most states have centres offering both MFM and malignant haematology services, where the patient can have the haematological malignancy managed at an onsite cancer centre, as well as access to MFM services for antenatal care and delivery. For example, in Sydney, these patients would receive maternity care at the Royal Women's Hospital, while their cancer treatment would be managed at Prince of Wales Hospital, which is co-located in the same building. On the other hand, in certain areas, haematology/chemotherapy is overseen at a tertiary centre, while MFM care is handled at a specialised obstetric facility. Such is the case for 'a' and 'b' centres found in Western Australia, Northern Territory and Newcastle. The latter scenario presents more significant challenges in terms of coordination and communication, likely leading to a less optimal patient experience. Implementing the aforementioned elements will allow women all over Australia to get the best care possible.

The hospitals highlighted in Figure 3 are capable of providing high-level care for women with haematological malignancies during pregnancy. In addition to malignant haematology services, these centres have access to a maternity unit with antenatal, intrapartum and postnatal care, including MFM, a high-risk midwifery team, a NICU and ultrasound imaging. They also possess an ICU, on-site tertiary imaging, pathology services with blood products, a pharmacy with cytotoxic agents and 24/7 operating theatre facilities with obstetric anaesthetic services. Additionally, they also possess dedicated perinatal mental health services and allied health teams, including psychologists and social workers. These core services identified are outlined in Figure 4.

Limitations of the current study include selection bias, where the search strategy limited the available literature, meaning that the review does not cover the full range of literature examining all haematological malignancies during pregnancy. Furthermore, due to the paucity of literature, papers with a low level of evidence such as case studies and case series were utilised. This also resulted in a small sample size of 44 articles. There were assumptions in the methodology. The study relied on self-reported data on service utilisation, which may be subject to recall bias. Similarly, the articles obtained in the systematic review were from different countries, with the assumption being that the data are generalisable to the Australian healthcare system. While this report aimed to cover all haematological malignancies, the literature search mainly found information on NHL, HL, acute leukaemia and myeloma. These publications were those that specifically mentioned MDTs and service utilisation. Even though, for example, myeloproliferative disorders might need a slightly different set of specialists, they would still likely benefit from the experience and collaboration found within these established MDTs. Furthermore, the varying pathological presentations of the diseases included in the reviewed literature require differences in staging, treatment and follow-up and therefore are confounding factors that may skew the data.[56] The list of potential facilities that may have the capability to manage these complex patients is not verified in terms of current capability, capacity or willingness to service this patient cohort. However, this study can inform health services research and national/state-based service development and planning to improve and monitor access.

There may be a role for establishing a national patient registry to enable systematic data collection of pregnant patients diagnosed with a haematological malignancy, leading to improvements in methods of diagnosis, staging and treatment. Acknowledging the complex ethics involved, a national registry of offspring would provide more complete data on the presently unknown short- and long-term complications of *in utero* exposures to cancer therapies. More comprehensive and complete data collection would help with clinical outcomes and health services research to improve the outcomes of pregnant women with haematological malignancies and their offspring.

In Australia, Commonwealth initiatives, such as the National Australian Cancer Plan and the National

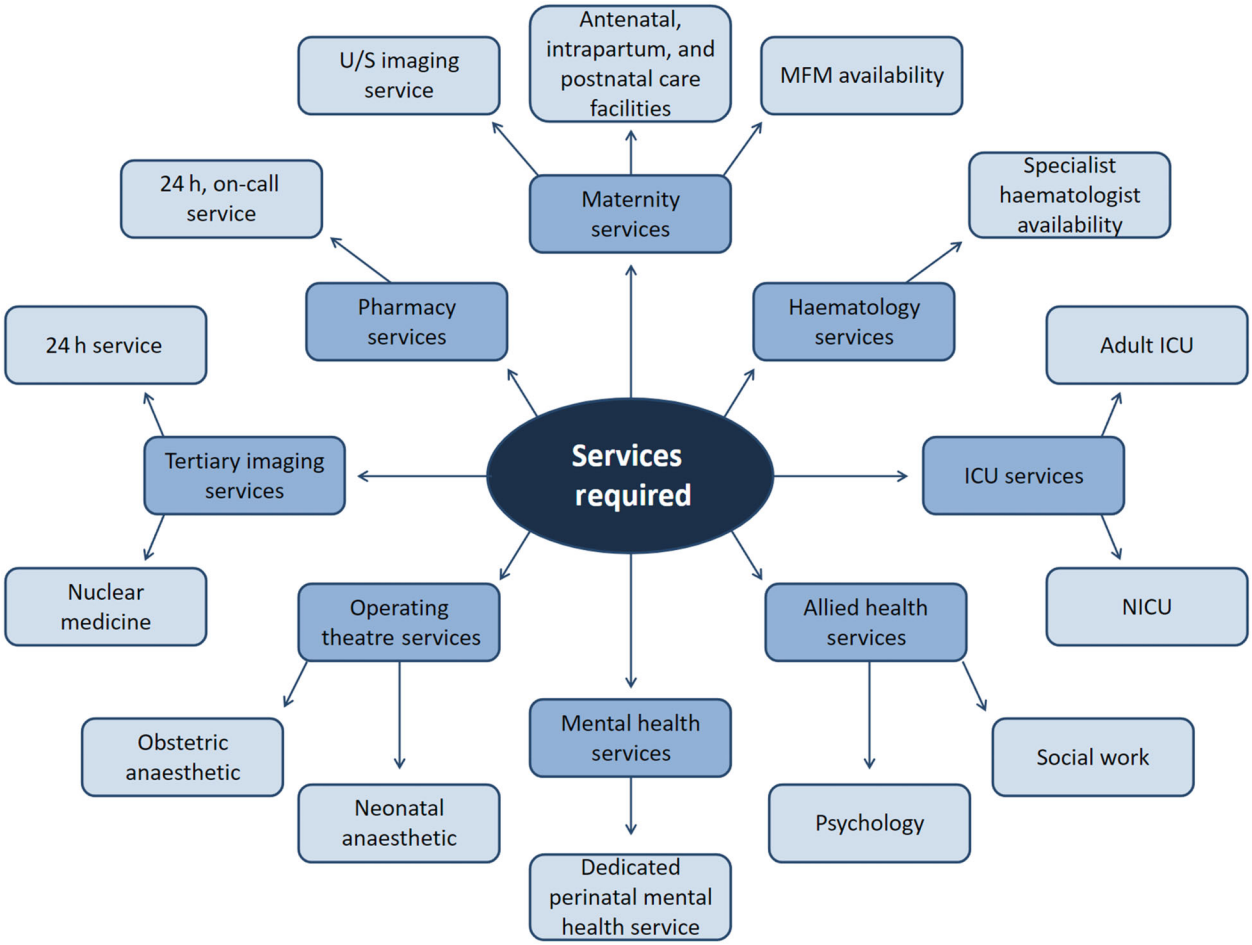

Figure 4 Core service utilisation identified from the literature review. ICU, intensive care unit; MFM, maternal–fetal medicine; NICU, neonatal intensive care unit; U/S, ultrasound.

Strategic Action Plan for Blood Cancer, provide frameworks for an overarching approach to cancer control that meets the needs of all Australians. In this plan, new Optimal Care Pathways provide wide-ranging, evidence-based recommendations for best practice care, from the point of diagnosis, through treatment, survivorship and end-of-life care.[57] However, despite the comprehensiveness of these new frameworks, currently there are no established national guidelines regarding the appropriate referral pathways, recommended resources and services, or safe treatment options for the management of pregnant patients diagnosed with a haematological malignancy. While there are no established national guidelines, regional and local guidelines may exist but are often not easily accessible or published and, therefore, not included in this search. Future directions of this research include implementing an optimal cancer care plan and frameworks for the best practice care for pregnant patients diagnosed with a haematological malignancy. Similarly, a centralised referral pathway is likely to bring more expedient, multidisciplinary action. Lastly, aiming for equity in access is paramount, to ensure patients diagnosed with a haematological malignancy during pregnancy have access to the best management possible, no matter where they live, which can be achieved via novel strategies including telehealth and virtual MDTs. It is important to acknowledge that MDTs will be challenged in the application of the rapidly evolving therapeutic advances in cancer that do not account for or include pregnant patients in clinical trials or real-world data.

Conclusion

Haematological malignancies diagnosed during pregnancy are rare events that pose unique therapeutic,

social and ethical challenges for the treating teams, the patient and her family. Nationally in Australia, there are no established guidelines regarding referral pathways, resources, and services required, or recommended treatment options for the optimal management of this patient group. The results obtained from this systematic review of the literature have identified MDT members most frequently needed to deliver perinatal cancer care to pregnant patients with haematological malignancies, including haematology, MFM, anaesthetics, neonatology, midwifery, ICU, psychology and social work. Furthermore, based on services utilised by patients in the included case studies, a total of 25 Australian hospitals were identified as having the potential to manage pregnant patients with a haematological malignancy and possess important core services required for the highest-level of care.

Moving forward, further research is needed to establish best practice guidelines, including optimal treatment regimens, centralised referral pathways and comprehensive care frameworks. These women face a diametric struggle between a life-giving and a life-threatening process. By implementing centralised referral pathways and readily available MDTs, we can uphold ethical principles of autonomy and beneficence, ensuring that the well-being of both mother and child remains the central focus of care. Furthermore, continued research is essential to address the long-term impacts of treatment on both mothers and their children, to refine diagnostic and staging approaches and to develop patient-centred decision aids that empower women to make informed choices about their care.

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Appendix I

Search strategy

MeSH search terms included 'haematological malignancy, lymphoma, leukaemia, myeloma, preg* and multidisciplinary'.

The inclusion criteria encompassed review articles, case studies, research reports, and articles written in English, spanning from January 2009 to December 2021. Additionally, citations within relevant articles were scrutinised for potential inclusion in this review.

Exclusion criteria encompassed articles lacking a case study on haematological malignancies during pregnancy, omitting discussion on the multidisciplinary management of such patients, failing to recommend the specialties pertinent to this patient cohort, and those not in English.

Appendix II

Raw patient data

Table 1 Raw data of the 36 patients utilised in the literature review

Case study	Dx	Age at dx (years)	GA at dx (weeks)	Pre-partum treatment	GA at treatment start (weeks)	GA at delivery (weeks)	Mode of delivery	Birth weight (g)	Neonatal outcome (APGAR)	Post-partum treatment	Maternal outcome	Notes
26	DLBCL (IIA)	20	30	R-CHOP (x1), vincristine omitted	32	34 + 5	Elective LSCS	2320		R-CHOP (×5)	CR	
27	NSHL (IIA)	32	22	ABVD (×2)	30	38	SNVD	3110	8, 9	3× escalated BEACOPP, 3× standard BEACOPP	CR	
28	ALL	27	27	Prednisolone, vincristine, daunorubicin, cyclophosphamide, l-asparaginase	28	33	Emergency LSCS	1750	4, 6			NICU 7 days mechanical ventilation
29	MM	33	14	—	—	34	Induced NVD	2350	10, 10	Bortezomib–dexamethasone, high-dose melphalan hydrochloride	CR	
30	DLBCL (IVB)	44	13	R-CHOP (×5)	13	31	Emergency LSCS	1753	5, 8, 10	R-CHOP (×2)	CR	ICU – neutropaenic sepsis for ventilation 11 days NICU for nCPAP 10 days
31	DLBCL	33	33	—	—	34	Elective LSCS	2356	9, 9	R-CHOEP (×1), DA-EPOCH (×5)	CR	ICU – SVC syndrome – 14 days NICU – 10 days
32	HL (IIA)	41	27	ABVD (×2)	28	33	Elective LSCS	2030 1785	9, 10, 10 9, 10, 10	ABVD (×6)	CR	Twins
33	BL (IV)	37	33	—	—	33	LSCS	1810	6, 8	R-CODOX-M/IVAC	CR	Caesarean section with surgical intestinal exploration, achieving at the same time delivery of the child and a definitive diagnosis of BL

Table 1 *Continued*

Case study	Dx	Age at dx (years)	GA at dx (weeks)	Pre-partum treatment	GA at treatment start (weeks)	GA at delivery (weeks)	Mode of delivery	Birth weight (g)	Neonatal outcome (APGAR)	Post-partum treatment	Maternal outcome	Notes
6	DLBCL	37	30	Da-R-EPOCH (×1)	33	35	Induced NVD	2585	8, 9	Da-R-EPOCH (×5)	CR	
6	NSHL	38	12	ABVD (×5)	15	37	SNVD	4195	9, 10	ABVD (×1)	CR	
34	ALCL (IA)	40	25	—	—	38	SNVD	3210	8, 9		CR	Surgical excision of lymphoma
35	HL	24	5	ESHAP, isofosfamide		39	SNVD	3005	8, 9		CR	
36	AML	31	14	Daunorubicin, cytosine arabinoside, fludarabine	15	—	—	—	—	Myeloablative HSCT	CR	Surgical abortion at AML diagnosis
36	AML	36	32	Daunorubicin and cytosine arabinoside	32	32	Elective SLCS	2110	6, 8	Auto HSCT	CR	
36	AML	32	26	—	—	32	Elective LSCS	2260	5, 6	Daunorubicin and cytosine arabinoside, alloHSCT	CR	NICU 5 days ventilation
36	AML	34	31	—	—	—	Emergency LSCS	—	—	Daunorubicin and cytosine arabinoside	CR	Intrauterine fetal death
36	AML	39	24	Daunorubicin and cytosine arabinoside	25	31	Elective LSCS	1495	5, 7, 10		Death	Maternal death from septic shock 4 days post delivery
37	APL	32	25	ATRA	25	31 + 2	Elective LSCS	1742	5, 7	Idarubicin	CR	NICU 3 days invasive ventilation
38	NSHL	30	5	—	—	—	—	—	—	ABVD (×6)	CR	Surgical abortion at 21 weeks
38	NSHL	25	5	—	—	—	—	—	—	ABVD (×6)	CR	Surgical abortion at 7 weeks
38	PCFL	36	6	—	—	—	—	—	—	R-CHOP (×6)	CR	Spontaneous miscarriage at 11 weeks
38	FL 3B	20	28	—	—	37	Elective LSCS	2550	8, 9	R-CHOP (×6), RT	CR	
39	DLBCL	28	14	CHOP (×3) R-CHOP (×3)	16	36	SNVD	2087	7, 8	Da-R-EPOCH (×2)	CR	NICU 2 days
40	DLBCL	28	15	CHOP (×3)	15	30	Elective LSCS			R-ICE	PD	NICU 45 days
41	HL (IIB)	21	14	—	—	37	Elective LSCS	2500	10, 10	DHAP (×2); brentuximab, gemcitabine and vinorelbine	PD	NICU 6 days

Table 1 *Continued*

Case study	Dx	Age at dx (years)	GA at dx (weeks)	Pre-partum treatment	GA at treatment start (weeks)	GA at delivery (weeks)	Mode of delivery	Birth weight (g)	Neonatal outcome (APGAR)	Post-partum treatment	Maternal outcome	Notes
42	DLBCL	37	18		18	33	Elective LSCS	1600	7, 9		Death	NICU 18 days Mother deceased 23 days post-delivery – ICU Neonate deceased 18 days post delivery
43	APL	24	25	ATRA, hydroxyurea	25	—	—	—	—	—	Death	Guardian withdrew medical treatment and discharged 48 h after admission due to deterioration of condition – multi-organ failure
43	APL	37	34	ATRA	34	36	SNVD	3200	7, 9, 10	ATRA	CR	NICU 21 days ventilation
44	AML	31	38			38	Emergency LSCS	3100			CR	
45	DLBCL (IVA)	30	32			33	Emergency LSCS	1760	5, 8	R-CHOP (×6), mediastinal RT 36 Gy	CR	NICU 37 days hyaline membrane disease, prematurity, ventilation ICU 5 days
46	CLL	31	9			38	Emergency LSCS	3690	8, 9		PD	
47	DLBCL	28	26	R-CHOP (×4)	26	36	Induced NVD	1860	9, 10	R-CHOP (×2)	CR	
48	DLBCL	31	34			35	Elective LSCS	2721	6, 8			NICU 14 days – CPAP ICU 14 days – ventilation, chemo
49	ALL	34	17	GMALL (prephase, induction, consolidation)	17	30	Elective LSCS	980	6, 8, 9	GMALL protocol	CR	NICU 8 days prematurity

Table 1 *Continued*

Case study	Dx	Age at dx (years)	GA at dx (weeks)	Pre-partum treatment	GA at treatment start (weeks)	GA at delivery (weeks)	Mode of delivery	Birth weight (g)	Neonatal outcome (APGAR)	Post-partum treatment	Maternal outcome	Notes
50	AML	30	18			33	LSCS	2010	7, 9	Mitoxantrone and etoposide (×1)	CR	ICU 4 days
51	DLBCL (IV) double hit	32	22			30	Induced NVD	1355	7, 8	R-CHOP (×1), Da-R-EPOCH (×4)	CR	ICU 14 days chemo

ABVD, doxorubicin, bleomycin, vinblastine, dacarbazine; ALCL, anaplastic large cell lymphoma; ALL, acute lymphoblastic leukaemia; AML, acute myeloid leukaemia; APL, acute promyelocytic lymphoma; ATRA, all-trans retinoic acid; BEACOPP, bleomycin etoposide doxorubicin cyclophosphamide vincristine procarbazine prednisolone; CLL, chronic lymphocytic leukaemia; CPAP, continuous positive airway pressure; DA-R-EPOCH, dose-adjusted rituximab, etoposide, prednisolone, vincristine, cyclophosphamide, doxorubicin; DHAP, dexamethasone cytarabine cisplatin; DLBCL, diffuse large B-cell lymphoma; FL, follicular lymphoma; HL, Hodgkin lymphoma; HSCT, haemopoietic stem cell transplant; LSCS, lower segment caesarean section; MM, multiple myeloma; NSHL, nodular sclerosing Hodgkin lymphoma; NVD, normal vaginal delivery; PCFL, primary cutaneous follicular lymphoma; R-CHOP, rituximab cyclophosphamide doxorubicin vincristine.