Integrative Transdisciplinary Care of Elderly Surgical Patients

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Take-Home Pearls

- Elderly surgical patients are complex with numerous facets to be managed.
- Holistic management demands an understanding of normal physiology, geriatric syndromes, nutrition, ADLs and psychosocial issues and how they interact with each other.

2.1 Complexities of the Elderly Patient

The approach to an elderly cancer surgery patient cannot be similar to that of a younger patient. While age alone has been shown to be not an independent predictor of poorer outcomes in some studies, elderly patients do come with more "baggage". The team managing an elderly patient has to often grapple with more issues than just the cancer pathology. Altered physiology and reduced functional reserves giving rise to the phenotype of frailty, co-morbidities and reduced abilities in activities of daily living exist in varying degrees and interplay with each other in elderly patients. Making sense of the complexities of each patient is mandatory for optimal management. With this comes the need for the understanding of the physiology of ageing and development of reduced functional reserves.

The process of ageing is accompanied by changes to the physiology of the body. While at a younger age, the physiological reserves of the different organ systems are bountiful, in an older person, these reserves may become depleted. In a younger person, normal homeostasis can be achieved without using any of these

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physiological reserves. On the other hand, an elderly person often depends on their physiological reserves to maintain homeostasis. These reserves are further depleted by competing co-morbidities. It should however be noted that biological ageing and accumulation of co-morbidities are separate processes but these two processes are not mutually exclusive and are interwoven together in a complex manner. As such, the ability to withstand acute illness and surgical stress is significantly reduced. In these situations, the elderly body may not be able to cope with the increased demands, and rapid decompensation occurs. The degree to which functional reserves are depleted is very heterogeneous, and a clear distinction should be made between biological ageing and chronological ageing.

This chapter explores the different facets of the elderly surgical patient that need to be addressed before optimal management can be achieved and suggests how care needs to be integrated in order to provide the multifaceted care that is demanded by an elderly surgical patient.

2.1.1 Physiological Changes in the Elderly

2.1.1.1 Changes to the Heart

The heart is perhaps one of the key organs that demonstrate both biological ageing and accumulation of disease in the elderly. It is well documented that an ageing heart has a reduction in the number of myocytes and an increase in the collagen content. This leads to reduced ventricular compliance that is often further aggravated by stiffening of outflow tracts (Rosenthal and Kavic 2004). The overall effect is that while there is maintenance of resting cardiac output, maximal capacity is reduced with ageing. There may also be changes to the autonomic tissue of the heart leading to an increased risk of arrhythmia and altered homeostatic balance of the heart function. Cardiac disease is also the most common co-morbidity in the elderly, and cardiac complications are most often associated with poorer outcomes (Tan et al. 2006).

2.1.1.2 Changes to the Respiratory Function

Ageing changes to the respiratory system include the decline in chest wall compliance secondary to structural changes of kyphosis, contractures of the intercostal muscles and calcification of costal cartilage (Christmas et al. 2006). In the lung parenchyma, there is loss of elasticity and collapse of small airways (Campbell 2000). These changes contribute to decreased functional residual capacity and residual volume and increased dead space. Furthermore, autonomic changes also result in a reduced response to hypercarbia and hypoxia (Campbell 2000). There may also be reduction in the natural protective mechanisms of the respiratory tract (Marik 2001). These factors lead to the increased susceptibility to pneumonia, aspiration and other pulmonary complications.

2.1.1.3 Changes to the Renal Function

By the age of 75, a person can lose about one third to half of their original nephron function. This functional decline of renal tubules makes dehydration a particular

problem as the capacity to compensate for non-renal losses is reduced (Rosenthal and Kavic 2004). There is also a reduced ability to maintain fluid and electrolyte homeostasis. This is often further confounded by the medications that the elderly are taking. These renal changes need to be considered in the pharmacology for elderly patients. Altered renal and hepatic drug metabolisms place the elderly patient at a higher risk of developing drug toxicities. Renal function may also be adversely affected by physiological changes to the voiding function with an increased prevalence of difficulty in voiding or urinary retention.

2.1.1.4 Changes to the Digestive System

The entire digestive system can be affected by ageing. Changes include changes to the nature and amounts of the secretions, changes in the autonomic system resulting in decreased peristalsis and reduction in gastric motility. Intestinal bacterial overgrowth may then occur. This is further aggravated by the altered ability to produce saliva and masticate, leading to a reduced choice of food. Nutritional absorption is thus affected.

It is thus not surprising that protein-energy malnutrition may quickly develop in the elderly when faced with stress (Lipschitz 2000).

2.1.1.5 Changes in the Nervous System

A steady loss of functional neurons starts to occur as early as the age of 25. With ageing, there is a slower response to stimuli, changes in the perception of the senses and also an increased risk of insomnia, irritability, memory loss and visual-motor deficits. The prevalence of dementia also increases with age. Dementia is an important entity in elderly surgical patients as it is the greatest risk factor for postoperative delirium which occurs in between 15 and 53 % of postoperative cases (Demeure and Fain 2006).

2.1.1.6 Changes to the Integumentary System

The skin loses elasticity and subcutaneous fat as a person ages. The small blood vessels under the skin also become more fragile. Injury secondary to shearing forces or pressure occurs more frequently; bruising is more common. The skin in the elderly is also more frequently dry owing to reduced oil and sweat production, coupled with reduced nutrient blood supply to the skin; wound infections are more common. Reduced vascular circulation and loss of subcutaneous tissue also predispose hypothermia in the elderly.

It is important to note that these changes occur in a very heterogeneous fashion in the elderly patient. The changes in the different organ systems occur at different paces and are confounded by co-morbidities and other environmental issues. While it is important to understand these changes, it is more important to individualise management strategies based on the unique assessment of the functional status of these systems in each elderly surgical patient.

2.1.2 Frailty and Geriatric Syndromes

The use of the clinical paradigm of frailty in the assessment of elderly patients is increasingly being recognised. There are still some controversies surrounding the

definition and applications of the syndrome of frailty. There is consensus however that the core features include impairments in multiple, interrelated systems, resulting in a reduced ability to tolerate stressors (Bergman et al. 2007). A very easily conceptualised physical phenotype of the syndrome of frailty is one that uses the criteria in Linda Fried's proposed definition (Fried et al. 2001). The criteria include assessment of weight loss, physical exhaustion, physical activity level, grip strength and walking speed. The details of the use of these criteria are detailed in a later chapter. Others authors however suggest that the operational use of frailty in clinical assessment goes beyond the physical description suggested by Fried and must include cognitive, functional and social assessment as well. It is interesting to note that frailty need not exist in persons with multiple co-morbidities; conversely some older persons with little or no disease show the classic signs of frailty (Fried et al. 2001). As such, frailty provides a totally new dimension as a tool that quantifies the vulnerability of elderly patients to stressors including surgery. And this may be independent of the co-morbidities of the same patient. This may explain why elderly patients deemed to have been optimised for surgery through traditional clinical and biochemical markers may still have poor outcomes (Makary et al. 2010). A recent study on elderly surgical patients showed precisely this concept (Tan et al. 2012). After optimisation based on traditional clinical and biochemical markers, while a high co-morbidity index score was not associated with a higher risk of postoperative morbidity, patients who were frail had a nearly four times higher risk. The phenotype of decreased resilience to surgical insult may in part be due to altered physiological systems, inflammatory state and immune function in frail patients (Walston et al. 2002; Leng et al. 2004).

The importance of assessment of geriatric parameters in a patient undergoing major surgery is increasingly being recognised. These geriatric parameters have been associated with not only poorer short-term outcomes (Ganai et al. 2007; Robinson et al. 2009) but also with an increased risk of delayed discharge and postoperative institutionalisation (Robinson et al. 2009; Makary et al. 2010).

2.1.3 Nutritional Aspects

While malnutrition is not inevitable in the process of ageing, there are many changes in the ageing body that makes an elderly person vulnerable to malnutrition. The main cause of undernutrition in the elderly is decreased food intake.

2.1.3.1 Poor Appetite

Poor appetite, or anorexia, is a major cause of decreased food intake and malnutrition in the elderly. Low physical activity, pain, social isolation and a number of diseases such as malignancies, depression or dementia may all lead to poor appetite. This is further confounded by impaired taste and smell. This impairment may lead to reduced enjoyment of food. Often, this is further exacerbated by disease and drugs. The prevalence of atrophic gastritis has been shown to rise with age, and

atrophic gastritis is a proven cause of malabsorption. An example of medication side effect is that of a 79-year-old lady that was severely bothered by a bitter taste in her mouth and was unable to eat anything. She had complained of this symptom to a few physicians with no solution. However, a pharmacist subsequently scrutinised the onset of this symptom and discovered that it was the clarithromycin, given to eradicate *Helicobacter pylori* infection, that caused the symptoms. Her symptoms disappeared after cessation of the medication.

2.1.3.2 Poor Dentition in the Elderly

The percentage of edentulism increases with age. The number of teeth left also declines steadily with age. Loss of teeth is associated with a reduced ability to masticate food. Absence of the posterior tooth pairs is associated with a reduced variety of food consumed. Even full denture wearers have a poorer diet compared with dentate people. The inability to maintain adequate oral health may also have a negative impact of food chewing and intake.

2.1.4 Activities of Daily Living

Activities of daily living (ADLs) refer to the basic tasks of everyday life. Persons of any age can experience problems in performing ADLs; however, the elderly population are particularly vulnerable to this problem. Disability increases exponentially with advancing age. While the ability to do ADLs and the presence of co-morbidities are not mutually exclusive, some elderly persons with no co-morbidities may have significant disability and vice versa.

2.1.4.1 Basic Activities of Daily Living

A significant number of elderly persons face difficulties in basic activities of daily living. These include activities that involve personal hygiene and grooming, feeding, dressing, toileting and bladder and bowel control. Basic physical mobility functions may also be compromised such as the ability to transfer from bed to chair, ambulation and climbing stairs. Over the years, different clinical tools have evolved in the measurement of ADLs. These scales include the Katz ADL scale and the Barthel scale which had subsequently been modified (this scale will be discussed in a later chapter). These tools not only provide a way to quantify the disability in a very heterogeneous elderly population but also allow some differentiation of the interventions needed to care for these persons. Disability in basic ADLs will likely result in the need for a rather involved carer.

2.1.4.2 Instrumental Activities of Daily Living

While basic ADLs are useful in measuring the functional disability in the home setting, they fail to address all the activities that are required for independent living in the community. Many elderly persons may be able to perform the basic activities in their own homes; however, they may struggle to perform activities that include marketing, preparing a meal, housework, laundry, taking care of personal finances and

taking medications. All these activities affect independent living and are particularly relevant in the setting of a postsurgical patient. The ability and need for an elderly individual to perform instrumental ADLs are dictated by his or her living arrangement and social support. An elderly individual living in an institution may not need to perform cooking or housework, while another who stays at home may have the inability to cook due to the presence of a younger wife cooking for him.

2.1.4.3 Cognitive Impairment

Cognitive impairment may affect the ADL status of an elderly. However, it should be noted that cognitive impairment and ADLs are separate domains. Elderly individuals who have cognitive impairment need not necessarily have a poor ADL status. As such, assessing ADLs alone in elderly patients may inadvertently miss individuals with cognitive impairment.

2.1.4.4 Activities of Daily Living in Elderly Surgical Patients

Cohort studies on elderly surgical patients have shown that patients with poor presurgical ADL status are more vulnerable to surgical complications. These patients are also likely to have significant deterioration in their functional status after surgery if not adequately rehabilitated (Tan et al. 2006). Thus, special attention has to be paid to this aspect during the perioperative period to avoid the need for the eventual use of long-term care services. ADLs and functional outcomes in elderly surgical patients have also been ignored by many surgeons. This was recently highlighted when a literature search on surgical outcomes in elderly patients found a paucity of data on the functional outcomes in elderly patients after surgery (Chee and Tan 2010).

2.1.5 Psychosocial Aspects

The continued well-being of an elderly individual does not hinge purely on health but also on the other aspects including the personal finances, social networking and social contribution. Social exclusion and isolation together with retirement stresses and notion of impending death can lead to the poor well-being of the elderly. Concomitant psychological issues including depression further deepen this problem. These aspects are further addressed in other chapters.

The complexities of an elderly surgical patient go beyond just the co-morbidities.

The normal physiology of ageing, geriatric syndromes, nutritional issues, activities of daily living and psychosocial issues all have to be taken into consideration when managing such a patient.

2.2 Transdisciplinary Approach in Elderly Surgical Patients

Having understood the complexities of an elderly surgical patient, it is then not difficult to understand the need for coordinated multifaceted care for these patients. The truth is that many modern institutions offer the resources to provide

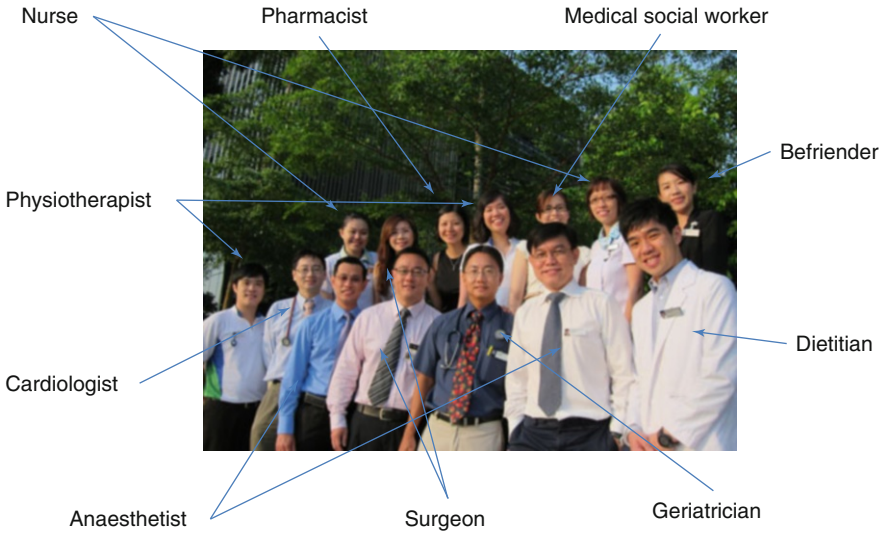

Fig. 2.1 Khoo Teck Puat Hospital Transdisciplinary Geriatric Surgery Team

this multifaceted care through the availability of multiple disciplines in clinical medicine and allied health. The availability of multidisciplinary care has often been presumed to be the final frontier of delivering optimal care to an elderly surgical patient. But is multidisciplinary care really the final frontier? When there is a surgical patient who has multiple co-morbidities, the primary surgeon will refer the patient to the dietitian and the cardiac specialist before the surgery. After the surgery, the physiotherapist will get involved in the rehabilitation, and upon discharge, a pharmacist will dispense medications to the patient. This is multidisciplinary care, but there are potential pitfalls to this model of care. The pitfalls have already been described in Chap. 1. Our unit advocates a transdisciplinary approach towards management of geriatric surgical patients. This transdisciplinary approach represents a higher evolution of the multidisciplinary approach. The key components in this transdisciplinary approach are described in the following section.

2.2.1 Key Components of Khoo Teck Puat Hospital Geriatric Surgery Service Integrative Transdisciplinary Model of Care

With the above-mentioned pitfalls of multidisciplinary care in mind, the Khoo Teck Puat Hospital Geriatric Surgery Service modelled the care of elderly surgical patients using a transdisciplinary approach (Fig. 2.1). The concept of transdisciplinary approach as an evolution of multidisciplinary care is not new. The biggest champions of this model are nurses. It is however only very recently that this model of care has been found to be useful in providing more holistic, coordinated and

Fig. 2.2 Patient involvement and active engagement in the prehabilitation process before surgery

seamless care for surgical patients. The key components of the transdisciplinary model of care for elderly surgical patients are as follows:

2.2.1.1 Patient Involvement in the Team

In this model, the patient is actively involved in the entire process. The patient is actively educated through multimedia tools on the pathology of their disease. This is followed by a stepwise consenting process for the proposed surgical procedure. Options for other viable options are discussed in a team-based fashion. The patient is then engaged actively in the process of prehabilitation (Fig. 2.2) and, after the operation, is empowered to perform activities of living early and also with the process of rehabilitation (Fig. 2.3). The patient is considered an essential component of the team. Through processes of education and engagement, compliance with the care plan is heightened.

2.2.1.2 Early Goal-Setting Identifiable to the Team

This component involved the identification of the key goals for the treatment of the patient. These goals are identifiable to the patient and family members and also to the entire team. These goals have to be individualised to the patient and should not be forced on the patient. Team members may discuss about the validity of these goals at initial assessment but have to be aligned once there is consensus.

Fig. 2.3 Patient 4 days after surgery being empowered to go to our gardens to feed the fishes as part of the process of building confidence to return home for independent living

2.2.1.3 Enhanced Coordination

The coordination of care is crucial to the delivery of seamless care to surgical patients. As such, the nurse clinicians on the team play a central role in providing oversight of the total care of each patient. Input from each element of the team is tracked by the coordinating nurse, and at the same time, targets are set with regard to the timing within which the intervention is to be performed. Patients who need to undergo prehabilitation have target milestones set and the date for surgery set. This is followed by coordination of inputs from the dietitian and physiotherapist not only in the inpatient setting but also in the outpatient setting and in patients' homes (Fig. 2.4).

Completed interventions are documented such that other members of the team are aware.

2.2.1.4 Heightened Communication

This is performed through formal meetings, frequent ad hoc discussions among team members, communications sheets in the case notes and the use of multimedia technology. Although this heightened communication is useful in the enhancement of care, patient confidentiality cannot be compromised and measures are put in place to ensure that this standard is upheld.

Fig. 2.4 Home visits to help patients stay compliant to treatment strategies and medications

2.2.1.5 Role Enhancements

The enhancement of the roles of the individuals in this team-based care in the implementation of transdisciplinary care includes role extension, role enrichment, role expansion, role release and role support. Role extension demands a constant learning attitude towards attaining knowledge of one's discipline and in doing so become secure with one's own role in the system. This is followed by role enrichment which involves acquiring knowledge and understanding of other disciplines and then role expansion as one then starts to educate other members of the team about one's own expertise. Only with these can role release and support occur, breaking the boundaries of traditional disciplines, and individuals can then exert an effect in a transdisciplinary fashion.

2.2.1.6 Start to Finish

The team's involvement in the surgical patient is from start to finish. The same individuals are present at the initial diagnosis and assessment, follow through consenting and prehabilitation, see the patient through surgery and are there for the rehabilitation, tackling problems with the patient as they arise. Care does not stop with discharge but continues into outpatients and the community (Fig. 2.5). Only through this process can the team truly build rapport with the patient and truly understand the difficulties faced by the patient during this whole process.

Fig. 2.5 Gathering of postsurgical patients to ensure that they continue to have the ability for independence and social integration

2.3 Integrative Decision-Making and Care Planning for Elderly Surgical Patients

Integrative care of an elderly surgical patient starts with proper surgical decision-making. The decision-making process is team-based and stepwise. It is critical to understand that decision-making in these elderly patients needs to take into full consideration the goals and concerns of the patient. Thus, engagement of the patient into this decision-making process through education and consultation on management approach is vital. In a recent study on the type of information patients desired before undergoing visceral surgery, more than 64 % of patients were keen to participate in medical decision-making with regard to management of surgical complications and management in the intensive care unit (Uldry et al. 2013). It is not appropriate to concentrate on the immediate perioperative period as 30-day mortality and morbidity may not clearly define good outcomes for elderly surgical patients. Functional recovery and independence are likely more important (Chee and Tan 2010). Furthermore another recent study from the Netherlands warned that a significant number of patients die within a year after curative colorectal surgery, and this data should impact our decisions in offering surgery (Gooiker et al. 2012).

The team should take into consideration clinical findings including co-morbidity index and frailty, together with aspects of nutrition, functional status and psychosocial problems in the decision-making process. These can only be assessed through a team-based approach with different members of the team providing expertise in the assessment process. A more holistic picture of the patient can then be painted to

aid in the decision-making process. The integration of geriatric assessment techniques have been shown to improve perioperative outcomes (Cheema et al. 2011).

Engagement of the family is important in this whole process, especially in certain cultures. The importance of the family was elegantly summarised in a Taiwanese study where surgical patients were found to perceive the importance of the family through maintaining family well-being, being useful as information broker and also as an advocate for the patient (Lin et al. 2013).

Surgical decision-making also involves team-based discussions on what to do, when to do and how to go about achieving the targets set for a particular patient. All members of the team including the anaesthetist, physicians and nurses must have an aligned vision for the patient. This then culminates in a stepwise consenting process that has been described in a previous book (Tan 2013).

Perioperative care planning also demands an integrative approach. Prehabilitation has to be linked seamlessly to immediate perioperative care and then to rehabilitation. At different stages, the components of care involved may be different. Prehabilitation involves education, nutritional preparation and mobility training together with muscle training. Immediate perioperative interventions involve planning for the conduct of the surgery, surgical techniques, prophylactic measures, anticipatory measures including lines and tubes and also pain relief measures. Rehabilitation on the other hand concentrates on functional recovery. Nonetheless, common targets need to be visualised, and interventions by every member of the team must be able to be coordinated with the plans of other members. Integrated decision-making involving members of the team thus becomes vital.

2.4 Integrating Prehabilitation, Rehabilitation and Nursing Care

Integration of care can be described through the description of the care of a patient managed by the Geriatric Surgery Service: Mdm GKK. Mdm GKK was 82 years old with diabetes, previous stroke, hypertension and hyperlipidaemia. She had undergone abdomino-perineal resection more than 10 years ago. She has had ongoing back pain with some resultant functional decline in recent months but with greater decline in the last 3 weeks. She was subsequently found to be anaemic with a metachronous ascending colon cancer. Mdm GKK stays alone in a one-room rented flat but has been independent thus far and hopes to continue to be independent without being a burden to her extended family members. Mdm GKK was assessed to likely benefit from cancer resection as she had good function previously and the recent decline is likely disease related and can potentially be reversed by removal of the disease. She was also found to be not frail. Nonetheless, her issues were complex, and she required multifaceted perioperative care which was delivered in a transdisciplinary fashion. Figure 2.6 describes the issues that were identified surrounding her surgical management. The roles and actions of the different players of the transdisciplinary team in the care plan for Mdm GKK are then shown in Fig. 2.7. For Mdm GKK, it was essential to develop a care plan from start to

Issues identified	Players	Integration processes
Colon tumour	Surgeon Nurses Anaesthetist	• Establish diagnosis. • Risk stratification. • Educate patient on disease pathology. • Family conference with patient and family. • Explore individualized treatment goals. • Discuss treatment options in relation to individual goals and risk stratification. • Pre-operative education to manage expectation and improve peri-op engagement. • Surgical, anaesthesia and analgesia planning.
Back pain from recent fall sec to postural giddiness and iron deficiency anaemia. Functional decline sec to limited mobility from back pain	Geriatrician Anaesthetist Cardiologist Orthopaedics Physiotherapist Pharmacist Dietitian Nurses	• Optimization of medical condition and review of medications to correct postural hypotension and electrolytes imbalance. • Blood transfusion to correct anaemia that can attribute to giddiness. • Exclusion of orthopaedics related injury causing back pain from recent fall. • Pain management for back pain to improve compliance and engagement in prehabilitative exercises. • Nutritional optimization with consideration for anaemia, hypoalbuminemia and risk of malnutrition due to poor social support and limited mobility. • Reinforcement of management plans with indication explained through education for better compliance.
Risk for post	Geriatrician Nurses Surgeon Anaesthetist Pharmacist Physiotherapist Dietitian	• Identification of risk factors and implementation of preventive measures. 1. Impaired mobility from surgical and back pain 2. Pre-op medications for management of back pain (Morphine, Tramadol and Gabapentin) 3. Iron deficiency anaemia (Decreased oxygen capacity in view of low hb). 4. Electrolytes imbalance (Potassium OA: 2.8mmol/L, Na: 131).
Social support 	MSW Physiotherapist Nurses Dietitian	• Stays alone in one room rented flat. • In view of acute functional decline and lack of caregiver support, referred for prehabilitation at community hospital. • Discharge plans explored before surgery.: • Continued rehabilitation after operation or • Home with home-based rehabilitation by nurses and allied health members with meal delivery support during early post operative period. Pre-emptive referral to community hospital made to minimise length of hospital stay.

Fig. 2.6 Issues identified in Mdm GKK and the players and interventions involved

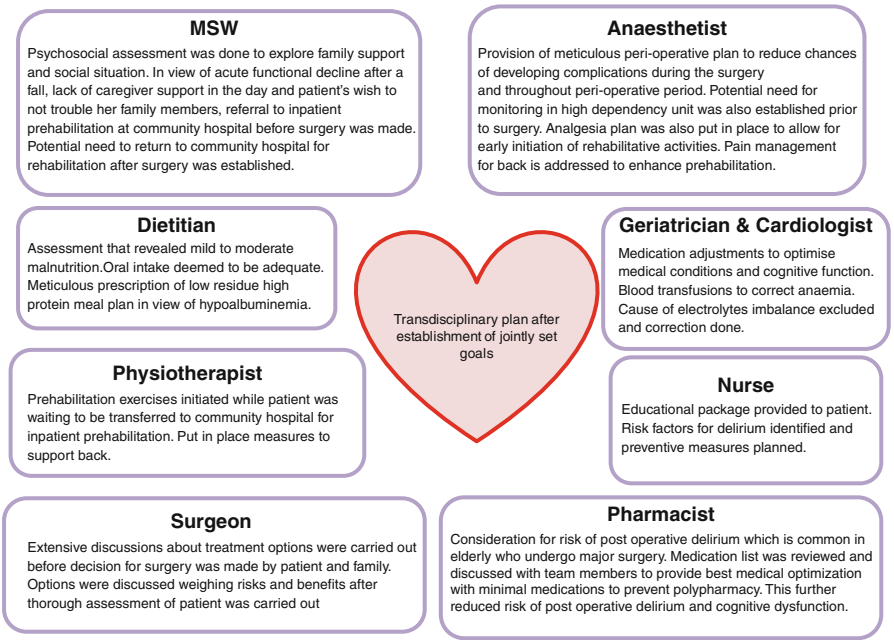

Fig. 2.7 Transdisciplinary care plan for Mdm GKK

finish starting with prehabilitation and nutritional optimisation, following through with meticulous surgery after medical optimisation, early development of a rehabilitation plan and anticipation of possible medical and social issues in the perioperative period. Mdm GKK returned to her premorbid functional status within 6 weeks after surgery, and home visits were made to ensure that she remained well.

Conclusion

Geriatric surgical patients are complex and demand multifaceted care which can only be delivered optimally in a collaborative transdisciplinary fashion.

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