

Supplementary Table 1 Multimodal prehabilitation program

Content	Description
Face to face or online sessions	Twice 90-min supervised group sessions (4 to 6 patients) consisting of 60 minutes of education and 30 minutes discussion.
Exercise Intervention: Walking	Walk facing forward, and not looking at the ground. First support the heel and then the toes. Keep your shoulders relaxed and your arms slightly swinging. Walk for 3 sets of 10 minutes resting 1 minute between sets. Finish the sets by walking slowly for 2 minutes to relax. Walk at a pace that you can maintain a conversation on a continuous basis, but that costs you a little effort.
Exercise Intervention: Getting up from a chair	Take two plastic bottles filled with 500 ml of water. Sit with your arms stretched along the body, and take a bottle in each hand. Bend your elbows towards your chest, and lift the bottles towards your shoulders. Perform 5 sets of 12 repetitions and rest 1 minute between sets.
Exercise Intervention: Squeeze a ball	Take a rubber or anti-stress ball in your hand and squeeze it gradually as hard as you can. Relax your hand. Perform 5 sets of 12 repetitions and rest 1 minute between sets.
Exercise Intervention: Pretend to sit	Stand in front of a table. Start bending down, bending your hips and knees as if you were going to sit down; then return to the standing position. Perform 3 sets of 12 repetitions and rest 1 minute between sets.
Exercise Intervention: Walking on tip toes and heels	Stand up and support yourself on the side of a table or a handrail. Walk 7 steps on “tiptoe” by supporting your weight only on the tips of your toes. Take a break and walk 7 steps, but now supporting yourself only on your heels. Perform 3 sets of 14 steps and rest 1 minute between sets.
Exercise Intervention: Arm stretching	You can sit or stand up for this exercise. Stretch your arms up with your hands clasped, as if you wanted to touch the ceiling. Hold the position for 10–12 seconds. Then pause and relax your arms for 5 seconds. Perform 5 sets of 3 repetitions and rest for 30 seconds between sets.
Exercise Intervention: Twist a towel	Grab the towel at both ends with both hands, and perform a movement similar to that of wringing a towel soaked with water. Squeeze little by little, but as hard as you can for 2–3 seconds. Perform 5 sets of 12 repetitions and rest 1 minute between sets.
Exercise Intervention: Chest press using an elastic band	Sit on a chair or stand against a wall with your feet hip-width apart. Extend both arms forward and hold a stretch band with your hands, pulling it apart to a 180° angle. Perform this stretch for 6 to 12 repetitions per set.
Exercise Intervention: Chest expansion using an elastic band	Sit on a chair or stand against a wall with your feet hip-width apart. Place the stretch band around your lower back, ensuring it is securely fastened. Grip the band with both hands, keeping it taut. Extend your arms forward until your arms are fully extended, feeling a stretch in your back. Perform this movement for 6 to 12 repetitions per set.

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Exercise Intervention: Supine gluteal bridge	Lie flat on your back on the bed, without a pillow, and bend your knees. Place your elbows and the back of your head against the bed to support your body. Lift your abdomen and buttocks off the bed, using your shoulders, elbows, and feet to support the entire weight of your body. Maintain this position for 3 to 5 seconds. Then, relax your waist muscles and lower your buttocks to rest for 3 to 5 seconds. Perform 10 sets in one session, and repeat this exercise twice a day. Patients who have experienced worsening symptoms of cervical or lumbar spine diseases within the past three months are advised against engaging in this exercise.
Exercise Intervention: Back muscle exercise	Lie face-down on the bed, without a pillow, and place your hands behind your back. Contract your chest and lift your head and chest off the bed. At the same time, keep your knees straight and push your thighs back so that they also leave the bed surface. Maintain this position for 3 to 5 seconds. Then, relax your muscles and rest for 3 to 5 seconds. This constitutes one cycle. Perform 10 sets in one session, and repeat this exercise twice a day. Patients who have experienced worsening symptoms of cervical or lumbar spine diseases within the past three months are advised against engaging in this exercise.
Nutrition optimization	<p>Patients are classified as being at high nutritional risk or malnourished (score < 24) or at low risk (score ≥ 24), according to the total MNA score obtained. Well-nourished patients will be provided with dietary advice on how to achieve set individual nutritional targets (energy intake of 20-25 kcal/kg/day and protein intake of 1.2-1.5g/kg /day). These patients will receive dietary counselling and individualized (based on body weight) plans to meet their energy and protein requirements (energy intake of 25-30 kcal/kg/d and protein intake of >1.2-1.5g/kg /day).</p> <p>To facilitate the achievement of these goals, oral nutritional supplements will be prescribed for patients unable to meet their protein and energy requirements through dietary intake alone.</p>
Sleep management	Protect brain function by improving sleep quality and establishing a regular sleep pattern. This may include adjusting the sleep environment, limiting evening caffeine intake, and implementing relaxation techniques, among other strategies.
Multiple medications	In addition to essential medications for chronic diseases, strive to reduce the variety of medications whenever possible.
Pain control	The application of stepped analgesia, multimodal analgesia, and non-opioid-based analgesia ensures adequate pain control.
Psychological support	Provide counseling and emotional support to help patients reduce surgical stress and anxiety. Improving cognitive reserve can be achieved through measures such as engaging in physical activity, participating actively in social activities, and encouraging mental exercises. A complex jigsaw puzzle will be provided to patients with cognitive impairment.

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Multidisciplinary management for patients at high risk of delirium	For high-risk patients such as the elderly, those taking psychotropic medications, and those on multiple medications, relevant education and intervention introduction will be conducted in collaboration with neurologists and anesthesiologists. Postoperatively, the CAM scale is used for delirium screening, and early intervention is initiated as needed.

CAM: Confusion assessment method