

Strength in numbers? Osteoporosis prophylaxis and fracture rates in heart and lung transplantation

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Introduction

Transplant recipients are at risk of osteoporosis and fragility fractures due to corticosteroid and immunosuppressant use. Pre-transplantation osteoporosis screening, and post-transplantation osteoporosis prophylaxis and treatment protocols are important to minimise fracture rates (Figure 1).

The transplantation program at St Vincent's Hospital Sydney performs approximately 25-30 heart and 60 lung transplants each year. It has performed over 1800 transplants to date.

The current heart/lung transplant osteoporosis prevention and treatment protocol includes PO cholecalciferol 25mcg – 1 capsule daily, PO calcium citrate 1.19g – 2 tablets daily, and IV zoledronic acid annually if BMD < -1.

Aim/Objectives

* To evaluate osteoporosis workup and adherence to prophylaxis/treatment protocols pre-heart/lung transplantation.

* To review adherence to osteoporosis prophylaxis/treatment protocols post-heart/lung transplantation and assess fragility fracture rates as a primary endpoint.

Method

A retrospective cohort study of heart/lung transplant recipients transplanted between 1/7/2020 and 31/12/2020 was performed. Patients were reviewed to April 2022. Electronic and paper medical records were reviewed. Institutional ethics approval was granted.



Figure 1: Pre-transplantation screening/workup for osteoporosis.

Results

The cohort consisted of 51 patients (19 females), mean age: 53.6 +/- 15.0 years at the time of transplantation. There were 32 heart transplants (HTX), 16 lung transplants (LTX) (including 1 redo), and 3 combined heart/lung transplants.

Pre-transplantation (n= 51)

- 45/51 (88%) patients were worked-up according to protocol (Figure 2)
- Osteoporosis documented in 11/51 (22%) patients
 - 8/11 (73%) commenced treatment (Figure 3)
- Osteopenia documented in 22/51 (43%) patients
 - 9/22 (41%) commenced oral prophylaxis with calcium and vitamin D supplementation (Figure 3)

Results continued

Post-transplantation (n= 46)

- 26/46 (57%) patients had BMD assessment (Figure 2)
 - 10/26 (39%) patients had osteoporosis
 - 12/26 (46%) patients had osteopenia
 - 4/46 (9%) patients had a new diagnosis of osteoporosis/osteopenia

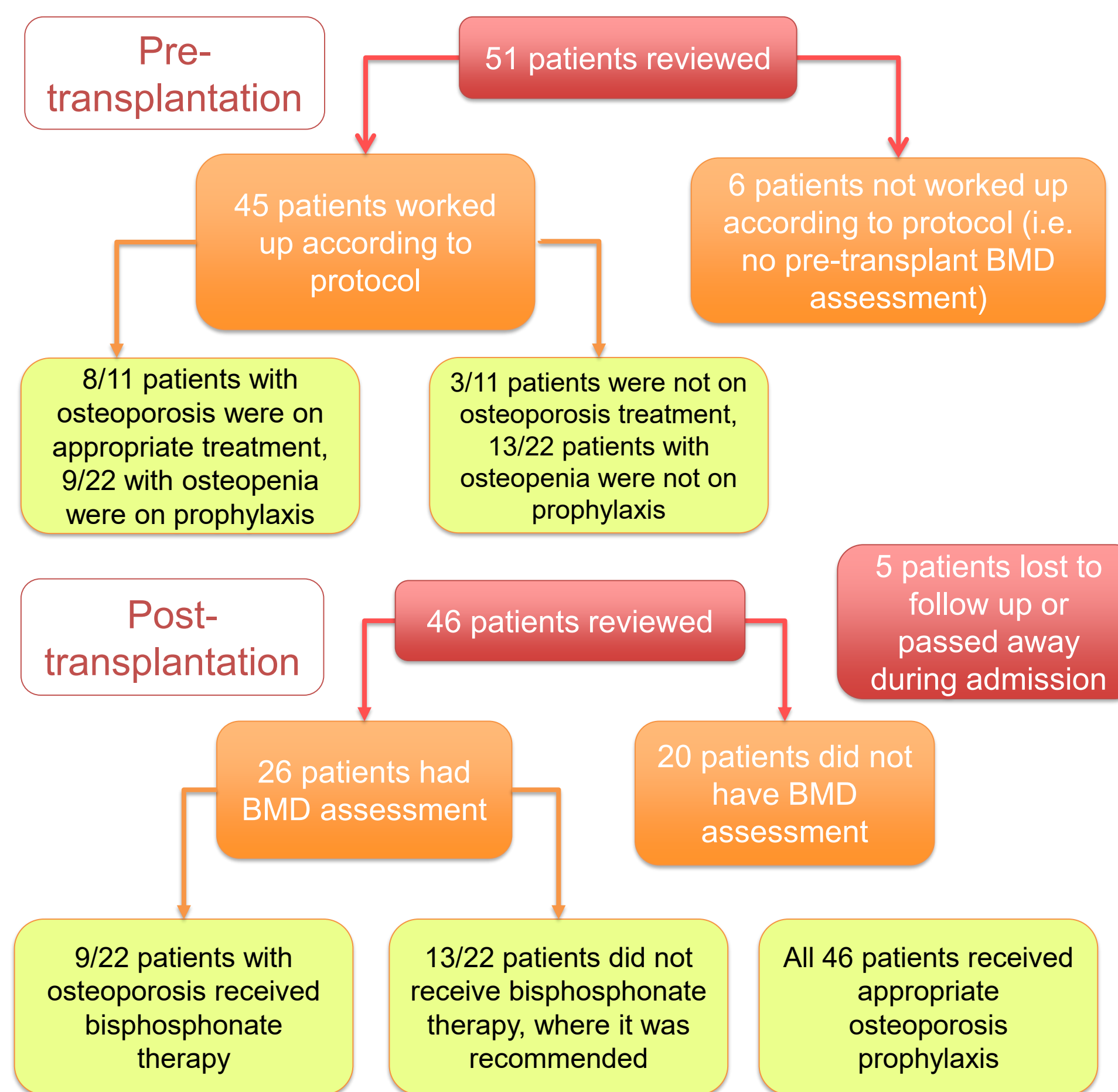


Figure 2: Flow diagram of patients included in study and results.

Based on the local post-transplantation protocol, 22/26 (85%) patients were recommended bisphosphonate therapy, of which 9/22 (41%) received it. All patients commenced appropriate oral prophylaxis post-transplantation according to protocol (Figure 3).

Fragility fractures

- Pre-transplantation, 9/51 (18%) patients experienced fragility fractures (Table 1)
 - 4/9 (44%) patients had osteoporosis
 - 3/4 (75%) of these patients were using appropriate treatment
 - Fracture rates → LTX (4/6, 67%) : HTX (0/4, 0%)
 - 3/9 (33%) patients had osteopenia
 - 1/3 (33%) patients were using appropriate oral prophylaxis
- Post-transplantation, 9/46 (20%) patients had fragility fractures (Table 1)
 - 3/9 (33%) patients had osteoporosis
 - Fracture rates → LTX (1/6, 17%) : HTX (2/4, 50%)
 - 3/9 (33%) patients had osteopenia
 - 4/9 (44%) patients who received bisphosphonate therapy still experienced fragility fractures

One patient with osteoporosis pre-transplantation had fractures documented both pre- and post-transplantation, despite use of cholecalciferol, calcium and denosumab pre-transplant, and denosumab post-transplant.

Table 1: Comparison of fracture rates for heart and lung transplant patients with documented osteoporosis/osteopenia pre- and post-transplant.

Fracture rates	Heart transplant (n = 32 pre-transplant, n = 12 post-transplant)			Lung transplant (n = 16 pre-transplant, n = 13 post-transplant)			Combined heart/ lung transplant (n = 3 pre-transplant, n = 1 post-transplant)	
	Osteoporosis	Osteopenia	Other	Osteoporosis	Osteopenia	Other	Osteoporosis	Osteopenia
Pre-transplant	0/4 (0.0%)	1/13 (7.7%)	1/32 – no documented bone issues	4/6 (66.7%)	2/8 (25.0%)	1/16 – no documented bone issues	0/1 (0.0%)	0/1 (0.0%)
Post-transplant	2/4 (50.0%)	3/5 (60.0%)	2/17 – no BMD recorded	1/6 (16.7%)	0/6 (0.0%)	1/13 – no documented bone issues	0/0 (0.0%)	0/1 (0.0%)

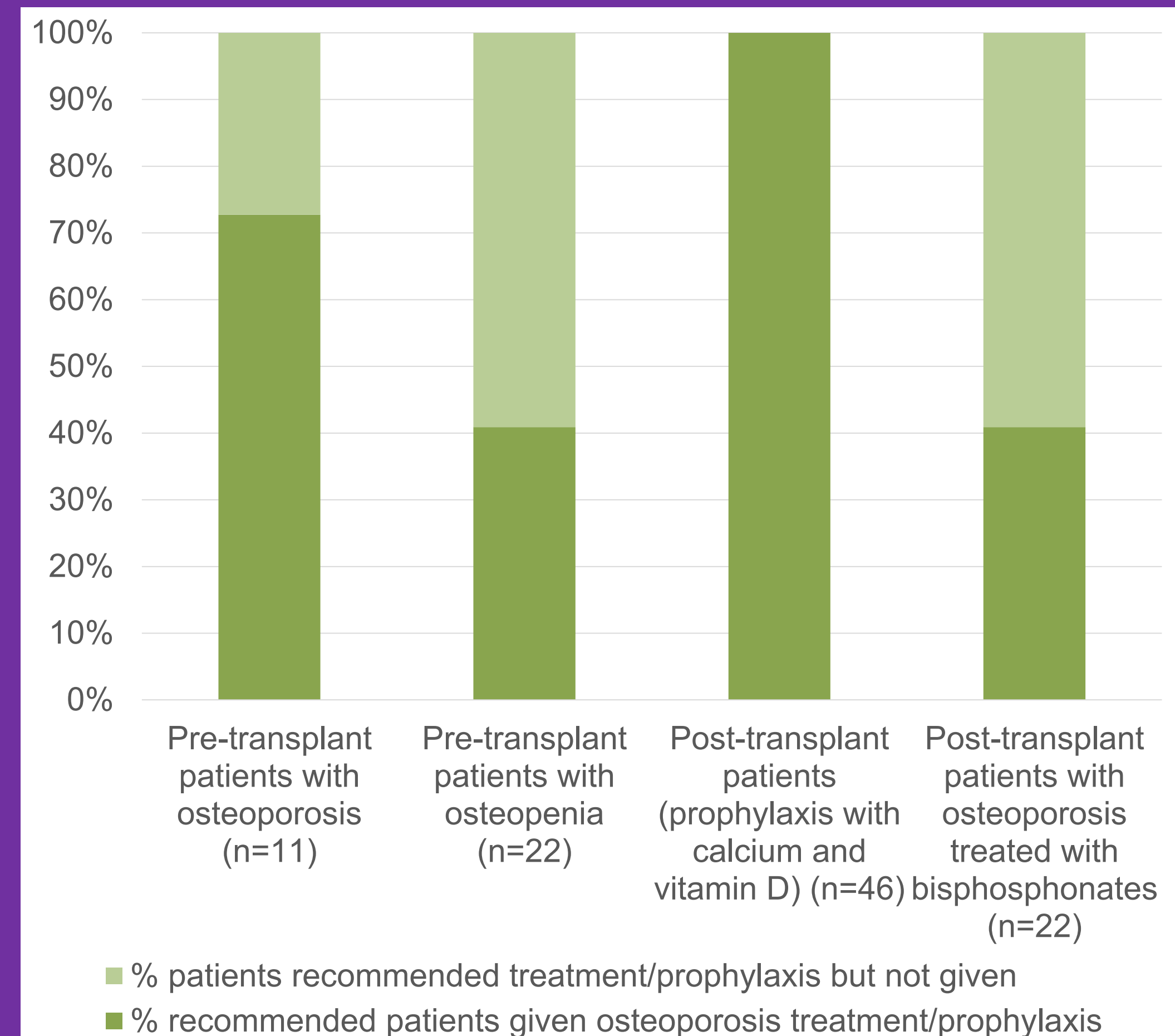


Figure 3: Adherence to pre- and post-transplantation bone management protocols.

Discussion

- Despite the use of bone management protocols, 20% of patients experienced fragility fractures within 17 months post-transplantation.
- 75% of patients with osteoporosis post-transplantation who also experienced fragility fractures were using calcium and cholecalciferol according to the local bone management protocol. Therefore, there is an opportunity for the protocol to be reviewed to minimise fracture rates post-transplantation in the future.
- Fragility fractures were more common in lung transplant patients than heart-transplant patients pre-transplantation, potentially due to greater glucocorticoid exposure. Osteoporosis prophylaxis should be a priority for this particular patient group.

Future directions

- There is room for improvement in adherence to osteoporosis treatment/prophylaxis protocols: 59% of patients did not receive bisphosphonate therapy post-transplant, despite it being recommended based on the local protocol. Furthermore, 27% patients with osteoporosis and 59% of patients with osteopenia pre-transplantation were not commenced on appropriate oral prophylaxis.
- In the future, pharmacists may identify these gaps and recommend appropriate therapy in accordance with the protocol, in preparation for heart and lung transplantation. Videos and resources available on the St Vincent's Heart and Lung health websites may raise patient awareness on the importance of osteoporosis prophylaxis.

The role of the pharmacist

Pharmacists have a role in identifying osteoporotic risk factors in transplant recipients, advocating for pre-transplant workup and patient education, and optimising bone health through pharmaceutical review.

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