

TITLE

Improving Compliance with Baseline Bone Health Assessment in Postmenopausal Women with Hormone Receptor-Positive Breast Cancer Receiving Adjuvant Letrozole: A Clinical Audit

Running Head

Bone Health Audit in Breast Cancer

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ABSTRACT

Background

Aromatase inhibitors (AIs) represent the standard adjuvant endocrine therapy for postmenopausal women with hormone receptor-positive breast cancer. Although highly effective in reducing recurrence risk and improving disease outcomes, AI therapy is associated with accelerated bone loss and increased risk of osteopenia, osteoporosis, and fragility fractures. International guidelines therefore recommend baseline assessment of bone mineral density using dual-energy X-ray absorptiometry (DEXA) before or shortly after initiation of AI treatment.

Objective

To evaluate compliance with baseline skeletal health assessment recommendations in postmenopausal women with hormone receptor-positive breast cancer receiving adjuvant letrozole and to assess the impact of an educational intervention on clinical practice.

Methods

A retrospective clinical audit was conducted at Baran Radiotherapy and Oncology Centre, affiliated with Lorestan University of Medical Sciences, Khorramabad, Iran. Medical records of postmenopausal women who initiated adjuvant letrozole therapy between March 2021 and March 2023 were reviewed. The audit standard required completion of a baseline DEXA scan within three months of treatment initiation. Following the initial audit, educational sessions targeting oncology physicians were implemented. A re-audit was conducted six months after implementation of the educational intervention using the same methodology.

Results

A total of 150 eligible patients were included in the initial audit cycle (mean age 60.8 ± 6.4 years). Baseline DEXA scan within three months of treatment initiation was documented in 48 patients (32.0%), with a median interval of 47 days from letrozole initiation to DEXA scanning. Following the educational intervention, a re-audit conducted six months later included 70 eligible patients (mean age 61.1 ± 5.9 years). Compliance increased to 63 patients (90.0%), with a median interval of 43 days from letrozole initiation to DEXA scanning.

Conclusion

Compliance with baseline DEXA scan recommendations was initially suboptimal. An educational intervention combined with audit feedback was associated with a marked improvement in adherence to the guideline-recommended baseline DEXA scan. Regular

audit cycles may represent an effective strategy for sustaining high-quality skeletal health assessment in breast cancer survivorship care.

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Keywords

Breast cancer; Aromatase inhibitors; Letrozole; Bone mineral density; DEXA; Clinical audit; Quality improvement

1. INTRODUCTION

Breast cancer remains the most commonly diagnosed malignancy among women worldwide and continues to be a leading cause of cancer-related morbidity and mortality. Advances in screening, diagnosis, and treatment have substantially improved survival, resulting in an increasing population of long-term breast cancer survivors. Consequently, greater attention has been directed toward the prevention and management of treatment-related complications that may adversely affect long-term health and quality of life. Among postmenopausal women with hormone receptor-positive breast cancer, adjuvant endocrine therapy with aromatase inhibitors has become the standard of care because of its superior efficacy in reducing recurrence and improving disease-free survival compared with tamoxifen. [1, 2]

Despite their therapeutic benefits, aromatase inhibitors are associated with accelerated bone loss caused by profound suppression of oestrogen production. This treatment-related reduction in bone mineral density increases the risk of osteopenia, osteoporosis, and fragility fractures, which may significantly impair quality of life and increase healthcare costs. [3–7]

To minimise these skeletal complications, several international organisations, including the National Comprehensive Cancer Network (NCCN), the National Institute for Health and Care Excellence (NICE), and the European Society for Medical Oncology (ESMO), recommend baseline assessment of bone mineral density using dual-energy X-ray absorptiometry (DEXA) before or shortly after initiation of aromatase inhibitor therapy. For the purpose of this audit, completion of a baseline DEXA scan within three months of treatment initiation

was adopted as the audit standard. Early identification of patients at increased risk facilitates the timely implementation of preventive measures, including lifestyle modification, calcium and vitamin D supplementation, weight-bearing exercise, and pharmacological therapy when indicated. [4–9]

Although these recommendations are well established, adherence to guideline-based baseline DEXA assessment remains inconsistent in routine clinical practice. Previous studies have reported suboptimal compliance with recommended skeletal health assessment among women commencing aromatase inhibitor therapy. Clinical audit is a recognised quality improvement methodology that evaluates current clinical practice against predefined standards, identifies deficiencies, implements corrective interventions, and reassesses performance through re-audit to determine whether improvements have been achieved. [10–12]

The present clinical audit was undertaken to assess compliance with baseline DEXA screening recommendations among postmenopausal women receiving adjuvant letrozole therapy at Baran Radiotherapy and Oncology Centre, affiliated with Lorestan University of Medical Sciences, Khorramabad, Iran. In addition, the audit evaluated whether an educational intervention for oncology physicians could improve adherence to the recommended baseline skeletal health assessment through a re-audit cycle.

2. OBJECTIVES

Primary Objective

To assess compliance with baseline DEXA screening recommendations in postmenopausal women commencing adjuvant letrozole therapy for hormone receptor-positive breast cancer.

Secondary Objective

To evaluate the impact of an educational intervention on adherence to baseline skeletal health assessment recommendations.

3. AUDIT STANDARD

The audit standard was derived from recommendations published by ESMO, NICE, NCCN and other expert consensus statements regarding skeletal health assessment in patients receiving adjuvant aromatase inhibitor therapy [4–9].

The audit standard was:

All postmenopausal women commencing adjuvant letrozole therapy should undergo a baseline DEXA scan within three months of treatment initiation.

In keeping with clinical audit methodology, the audit team selected a target compliance rate of $\geq 90\%$ as a realistic benchmark for high-quality clinical practice. Although international guidelines recommend universal baseline assessment, they do not specify a numerical target for compliance.

4. METHODS

Study Design and Setting

This study was a retrospective clinical audit conducted at Baran Radiotherapy and Oncology Centre, affiliated with Lorestan University of Medical Sciences, Khorramabad, Iran.

The audit was designed according to the principles of the clinical audit cycle, which involves assessment of current practice against predefined standards, implementation of corrective measures where necessary, and subsequent re-evaluation of performance.

Patient Population

Medical records of consecutive postmenopausal women with hormone receptor-positive breast cancer who initiated adjuvant letrozole therapy between March 2021 and March 2023 were reviewed. Patients were managed by a multidisciplinary oncology team consisting of

two consultant oncologists and two assistant consultant oncologists throughout both audit cycles.

Patients were considered eligible for inclusion if they met all the following criteria:

1. Postmenopausal status
2. Histologically confirmed hormone receptor-positive breast cancer
3. Initiation of adjuvant letrozole therapy
4. Availability of complete medical records

Patients receiving alternative endocrine therapy regimens or those with incomplete documentation were excluded from the audit.

Data Collection

Data were extracted retrospectively from routinely maintained medical records using a standardised audit data collection form. Information collected included patient age, documentation of a baseline DEXA scan, and the interval between initiation of adjuvant letrozole therapy and completion of the baseline DEXA scan. The primary outcome measure was documentation of a completed baseline DEXA scan performed within three months of initiation of adjuvant letrozole therapy. Compliance was calculated as the proportion of eligible patients who underwent baseline DEXA scanning within the predefined timeframe.

Statistical Analysis

Continuous variables, including patient age, are presented as mean $\pm$ standard deviation (SD), while the interval between initiation of letrozole therapy and DEXA assessment is presented as the median. Categorical variables are presented as frequencies and percentages.

Compliance rates were calculated as the percentage of eligible patients who underwent a baseline DEXA scan within 3 months of treatment initiation.

No formal statistical comparisons were performed because the primary objective of the project was quality improvement and assessment of adherence to a predefined audit standard rather than hypothesis testing.

Changes in compliance rates between audit cycles were therefore evaluated descriptively.

Educational Intervention

Following completion of the initial audit cycle, findings were presented during departmental oncology meetings attended by physicians involved in the management of breast cancer patients.

A structured educational intervention was subsequently delivered to oncology physicians involved in breast cancer care. The sessions included presentations on aromatase inhibitor-associated bone loss, osteoporosis risk, current NCCN, NICE, and ESMO recommendations, interpretation of DEXA scans, and the importance of timely referral and documentation of baseline bone health assessment.

Findings from the initial audit were reviewed with participating physicians, highlighting the low rate of compliance with guideline-recommended baseline DEXA scan. Common barriers to timely bone health evaluation were discussed, including limited awareness of guideline recommendations and inconsistent incorporation of baseline DEXA scan requests into routine clinical practice.

Physicians were encouraged to incorporate baseline DEXA scan into treatment planning for all eligible postmenopausal women commencing adjuvant letrozole therapy. Key audit findings and recommendations were disseminated locally to reinforce adherence to evidence-based bone health assessment practices.

The primary objective of the intervention was to improve physician awareness of guideline-based bone health assessment, address identified barriers to compliance, and facilitate integration of baseline DEXA scan into routine oncology practice.

Re-Audit

A re-audit was conducted six months after implementation of the educational intervention. The same audit standard, inclusion criteria, and data collection methods were applied during the re-audit cycle. The re-audit included all eligible consecutive postmenopausal women who commenced adjuvant letrozole therapy during the six-month period following implementation of the educational intervention.

Ethics and Governance

This project was conducted as a clinical audit and quality improvement initiative using anonymised routinely collected clinical data. The audit evaluated current practice against established standards and did not involve any change to patient management or treatment allocation. According to local institutional policy, formal ethics committee approval and informed consent were not required for this quality improvement activity. At the time the audit was conducted, there was no formal clinical audit registration process at our institution.

5. RESULTS

Initial Audit

A total of 150 eligible postmenopausal women receiving adjuvant letrozole therapy were identified during the initial audit period. The mean age was 60.8 ± 6.4 years. Patients were managed by two consultant oncologists and two assistant consultant oncologists.

Baseline DEXA scan within three months of treatment initiation was documented in 48 of 150 patients (32.0%). Among patients who underwent DEXA scanning, the median interval from initiation of letrozole therapy to DEXA scan was 47 days.

This compliance rate was substantially below the predefined audit target of $\geq 90\%$.

Re-Audit

Following implementation of the educational intervention, a re-audit was conducted six months later using the same methodology and audit standard.

A total of 70 eligible postmenopausal women were included. The mean age was 61.1 ± 5.9 years. Patients continued to be managed by the same team of two consultant oncologists and two assistant consultant oncologists.

A baseline DEXA scan within 3 months of treatment initiation was documented in 63 of 70 patients (90.0%). The median interval from initiation of letrozole therapy to DEXA scan was 43 days. Compliance improved by 58 percentage points compared with the initial audit cycle.

Table 1. Compliance with Baseline DEXA Screening Recommendations Before and After Educational Intervention

Variable	Initial Audit	Re-Audit
Eligible patients	150	70
Mean age (years)	60.8 ± 6.4	61.1 ± 5.9
Baseline DEXA completed	48	63
Compliance (%)	32.0	90.0
Median time to DEXA (days)	47	43

The educational intervention was associated with an absolute improvement of **58 percentage points** in compliance with baseline DEXA screening recommendations.

These findings demonstrate a marked enhancement in the implementation of guideline-based skeletal health assessment following the dissemination of audit findings and targeted physician education.

6. DISCUSSION

This clinical audit evaluated adherence to baseline DEXA scan recommendations among postmenopausal women receiving adjuvant letrozole therapy for hormone receptor-positive breast cancer. The findings demonstrated that compliance with guideline-based DEXA scan recommendations was initially poor, with only 32.0% of eligible patients undergoing baseline DEXA scan within three months of treatment initiation. Following implementation of the educational intervention, compliance increased from 32.0% to 90.0%, achieving the predefined audit target and demonstrating the effectiveness of targeted physician education.

The baseline demographic characteristics were comparable between the two audit cycles, with similar mean patient ages. Likewise, the median interval from initiation of letrozole therapy to DEXA scanning remained within the recommended three-month period among patients who underwent assessment. These findings suggest that the observed improvement in compliance was primarily related to the educational intervention rather than differences in patient characteristics.

Aromatase inhibitors have become the standard endocrine treatment for postmenopausal women with hormone receptor-positive breast cancer because of their superior efficacy compared with tamoxifen in reducing disease recurrence. However, the profound oestrogen suppression induced by these agents accelerates bone turnover and contributes to progressive bone loss. Numerous studies have demonstrated that women receiving aromatase inhibitors experience reductions in bone mineral density and are at increased risk of osteoporotic fractures. Consequently, professional organisations including NCCN, NICE, and ESMO consistently recommend baseline skeletal health assessment and ongoing monitoring in this patient population [4–9].

Despite the availability of clear recommendations, implementation of guideline-based skeletal health assessment remains inconsistent in routine oncology practice. Our findings are consistent with previously published audits demonstrating suboptimal adherence to baseline DEXA scan recommendations.

Zekri and Farag reported baseline compliance of 51.2% among postmenopausal women commencing aromatase inhibitor therapy, which improved to 90.4% following an educational intervention. Similarly, Dong et al. demonstrated significant improvements in DEXA referral

rates after dissemination of audit findings and educational measures. Gibson and O'Bryant also identified substantial gaps between guideline recommendations and routine clinical practice regarding bone health assessment in women receiving aromatase inhibitors [10–12].

Although our baseline compliance rate of 32.0% was lower than that reported in some previous studies, the post-intervention compliance achieved at our institution was comparable with the highest rates reported in the literature. These findings suggest that educational interventions may be highly effective regardless of baseline institutional performance.

The findings of this audit reinforce the importance of integrating survivorship care principles into routine oncology practice. While cancer-directed treatment remains the primary focus during active management, long-term treatment-related complications such as osteoporosis may significantly affect quality of life. Ensuring timely skeletal health assessment, therefore, represents an important component of comprehensive cancer care rather than an optional adjunct to treatment.

Several factors may contribute to inadequate adherence to bone health recommendations in routine oncology practice. Clinicians frequently prioritise cancer-directed treatment and surveillance while long-term survivorship issues receive less attention. Responsibility for osteoporosis screening may also be perceived as the primary care physicians' rather than oncology teams'. Limited awareness of current recommendations, competing clinical priorities, and workflow barriers may further contribute to underutilisation of baseline DEXA scan.

The marked improvement observed following the educational intervention supports the hypothesis that a lack of awareness is an important contributor to non-compliance.

Educational sessions provided clinicians with updated information regarding aromatase inhibitor-associated bone loss, current international recommendations, and the clinical importance of timely skeletal health assessment.

Dissemination of audit findings may also have increased awareness of local practice deficiencies and encouraged implementation of corrective measures.

The clinical implications of improved compliance extend beyond the achievement of audit standards. Early identification of patients at risk of osteoporosis enables implementation of

preventive interventions before clinically significant skeletal complications develop. Lifestyle modification, optimisation of calcium and vitamin D intake, weight-bearing exercise, and pharmacological interventions when indicated may reduce future fracture risk and improve long-term quality of life. Improved adherence to baseline DEXA scan recommendations therefore represents an important component of comprehensive survivorship care.

Clinical audit remains one of the most practical and effective quality-improvement tools available within healthcare systems. By systematically comparing clinical practice against predefined standards, identifying deficiencies, implementing corrective measures, and reassessing outcomes, an audit facilitates continuous improvement in patient care. The substantial improvement observed during the re-audit cycle highlights the value of this approach in promoting evidence-based practice.

Continued audit cycles are required to ensure the sustainability of the improvements observed following educational intervention and to maintain adherence to guideline-based skeletal health assessment recommendations.

7. LIMITATIONS

Several limitations should be acknowledged.

First, this audit was conducted at a single oncology centre and therefore may not be representative of practice patterns in other institutions.

Second, the study focused specifically on compliance with baseline DEXA scan recommendations and did not evaluate bone mineral density results, osteoporosis prevalence, fracture incidence, or subsequent treatment interventions.

Third, the retrospective nature of the audit meant that findings depended on the completeness and accuracy of documentation within medical records. It is possible that some assessments were performed but not adequately documented.

Fourth, the re-audit cohort was smaller than the initial audit population, which may limit direct comparison between audit cycles.

Finally, the audit was not designed to evaluate long-term patient outcomes. Future studies examining the impact of improved compliance on osteoporosis diagnosis, fracture prevention, and long-term survivorship outcomes would provide further evidence regarding the clinical benefits of guideline-based skeletal health assessment.

8. CONCLUSION

In conclusion, baseline bone health assessment was underutilised among postmenopausal women receiving adjuvant letrozole therapy. A structured educational intervention combined with audit feedback resulted in substantial improvement in compliance with international recommendations, increasing adherence from 32.0% to 90.0%. These findings demonstrate that targeted educational strategies can significantly improve adherence to guideline-based skeletal health assessment practices. Continued audit cycles together with regular educational initiatives are recommended to sustain these improvements and support high-quality survivorship care.

CONFLICT OF INTEREST

The author declares no conflicts of interest.

Author Contributions

Mahshid Abbasi conceived and designed the study, collected and analysed the data, conducted the clinical audit and re-audit, interpreted the findings, drafted the manuscript, and approved the final version of the manuscript.

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Ethical Approval

This study was conducted as a clinical audit and quality improvement project using anonymized routinely collected clinical data. According to local institutional policy, formal ethics committee approval and informed consent were not required.

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DATA AVAILABILITY STATEMENT

The data supporting the findings of this clinical audit are available from the corresponding author upon reasonable request.

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