

Satisfaction of Patients Examined with Mobile X-Ray vs. X-Ray at the Hospital—A Randomized Controlled Trial

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Abstract

Background: In the Municipality of Aarhus, Denmark, mobile X-ray is offered to selected patients when a transfer to the Department of Radiology may be an obstacle. To our knowledge, no studies have examined patient's satisfaction with mobile X-ray in a randomized controlled trial, but international qualitative and quantitative studies report a high level of patient satisfaction with mobile X-ray. **Purpose:** The purpose of the study was to investigate whether patients in aged care facilities who were offered mobile X-ray were more satisfied with the X-ray examination compared to patients examined with X-ray at the Department of Radiology, Aarhus University Hospital. **Design:** A part of a randomized controlled trial. **Methods:** Satisfaction was measured using a self-developed questionnaire, containing 13 questions measuring satisfaction from different perspectives. **Participants:** Due to patient's fragility, healthcare staff members answered questions concerning satisfaction on behalf of the patients, who had been examined with mobile X-ray (n = 66) or X-ray at the hospital (n = 63). The patients were living in nursing homes and homes for the elderly in Aarhus Municipality. **Data:** Data were collected and stored using the computer program REDCap. Data were statistically analyzed using Fisher's exact test. **Results:** Patients examined with mobile X-ray had a significantly higher satisfaction rate than those examined with X-ray at the hospital. **Conclusion:** Satisfaction of patients examined with X-ray was reported by healthcare staff to be in favor of mobile X-ray.

Keywords

Mobile X-Ray, Patient Care, Satisfaction, Questionnaire, Patient Perspective

1. Introduction

1.1. Background

1.1.1. Mobile X-Ray

Mobile X-ray examination takes place outside the hospital setting using transportable X-ray equipment. It is offered to patients when a transfer to the hospital at the radiology department may be an obstacle, and the referring doctor, therefore, considers it preferable for the patient to be examined in their homes. Mobile X-ray is used in countries including Norway, Sweden and Italy [1]-[8]. In Aarhus Municipality of Denmark, elderly patients living in aged care facilities have been offered mobile X-ray examination since the year 2014 [9]. Patient's frailty is the reason why they are offered mobile X-ray.

1.1.2. Satisfaction

Patient satisfaction is important for compliance with care, continuity of care, and the relationship with the care giver [10] [11]. Various validated and general tools have been developed to explore the patient's experience with the given care, such as the "Quality of Care through the Patient's Eyes" and the "Consumer Assessment of Healthcare Providers and Systems" surveys [12] [13]. Unfortunately, the questionnaires in these tools are intended to measure the experience of care at the meso level of healthcare and not satisfaction with the examination. Even though measuring patient satisfaction is challenging, it is important in order to improve and assure the quality of care in the use of mobile X-ray. Therefore, a tool specifically developed using questions concerning patient's satisfaction is needed [14].

1.1.3. Satisfaction with Mobile X-Ray

Qualitative and quantitative studies report that patients, relatives and healthcare staff are satisfied with mobile X-ray [2] [7] [8] [15]. Eklund studied patient's satisfaction in a descriptive study, but only half of the patients were able to respond [2]. Ricauda studied patient's satisfaction in a pilot Randomized Controlled Trial (RCT), and reported a high level of satisfaction, but the authors did not describe the data collection methods [7]. Vigeland studied satisfaction by interviewing the referring doctors, but not the patients [8]. A commonality of the studies is that they report a high level of satisfaction with using mobile X-ray.

1.1.4. Measuring Satisfaction with Mobile X-Ray

Measuring patient satisfaction is complex due to the multiple variables affecting satisfaction, especially in a frail and very ill patient population. Therefore, determining how to measure patient satisfaction was a challenge. In a pilot questionnaire study of 10 aged care facility patients, we asked questions concerning the patients' moods or physical aspects, which were possible for the patients to answer. However, in terms of questions concerning the X-ray examination, some of the patients did not even know that they had been examined and therefore were unable to answer questions concerning their satisfaction with the examination, probably because the majority of the patients were very frail and had cognitive im-

pairments [16].

1.1.5. Aim

Our aim was to investigate whether patients in aged care facilities, who were offered mobile X-ray, were more satisfied with the X-ray examination compared to patients examined with X-ray at the Department of Radiology at Aarhus University Hospital.

2. Materials and Methods

The reason to develop a questionnaire measuring satisfaction was so that we could develop a questionnaire specific to our context, with a focus on the specific patient group, to compare the level of satisfaction. We found that asking healthcare staff to answer on behalf of fragile patients was the best method, even though the proxy answers from healthcare staff and family differ from the patients' answers for both patients with or without cognitive impairments. However, when nursing home residents are both more and less cognitively impaired, the agreement of answers between nursing home residents and proxies is slightly better [17] [18] [19]. Therefore, proxy answers were the best method in our study.

2.1. Patients

2.1.1. Inclusion Criteria

Patients were recruited from nursing homes and homes for the elderly in Aarhus Municipality. Patients were eligible for inclusion if they had been referred for a mobile X-ray examination.

2.1.2. Exclusion Criteria

Patients hospitalized at the University Hospital, homeless patients, handicapped patients and patients already examined with mobile X-ray in the study period were excluded.

2.1.3. Ethical Considerations

We had several ethical considerations in conducting a RCT in this study population, because the patients were fragile. The patients needed a mobile X-ray examination because of a referral and therefore, it may not have been ethically appropriate to offer them an X-ray at the hospital, as the patients may not have been able to attend their appointment. On the other hand, had mobile X-ray not existed, the patient would not have been offered a mobile X-ray and therefore would have had to be examined with X-ray at the hospital. Also, mobile X-ray was not offered with solid evidence and therefore, the patients were randomized in order to study the evidence of mobile X-ray, where half of the patients were examined with mobile X-ray and the other half was examined with X-ray at the hospital. Therefore, we thought that it was ethically appropriate to randomize the patients.

The study was approved by the Ethical Committee (53,811) and Data Protection System (1-16-02-124-15) in the Central Denmark Region and registered at

<https://clinicaltrials.gov/> (NCT04005040). Involved departments at Aarhus University Hospital gave their consent for examining the Electronic Patient Journal (EPJ). Informed consent was not obtained because the study was approved as an organizational study by the Ethical Committee.

2.2. Study Design

The study reported in this paper, was part of a non-blinded RCT where we studied and documented the effect of mobile X-ray in aged care facility patients as a part of a Ph.D. study, where hospitalizations was the primary outcome [16]. Patients examined with mobile X-ray were compared to patients examined with X-ray at the hospital. A power analysis was conducted for the main study, but no power analysis was conducted for the study reported in this paper. Assessing satisfaction with mobile X-ray, was one of the studies conducted.

2.2.1. Randomization and Blinding

After the patients were referred for mobile X-ray, they were randomized to either be examined with mobile X-ray in their own home (nursing homes or homes for elderly) or X-ray at the University Hospital, at the Department of Radiology. The computer program Redcap was used to randomize patients via a computer-generated block randomization with blocks of eight patients in each group. It was not possible to blind anyone in the study due to the characteristics of the intervention.

2.2.2. Inclusion of Patients

The inclusion period started on May 1, 2018 and lasted until April 12, 2019. In that period, 177 patients were randomized to be included in the study. Of the 177 patients, 43 patients were excluded due to not fulfilling the inclusion criteria and three patients were excluded because they did not complete the examination. A total of 131 patients were included as treated and of those questionnaires were answered on behalf of 66 patients in the intervention group and 63 patients in the control group. In **Figure 1**, patient inclusion flow is shown.

2.2.3. Intervention Group (n = 66)

The intervention group comprised patients examined using mobile X-ray in their own home/institution and their careers, who answered the questionnaire.

2.2.4. Control (n = 63)

The control group comprised patients examined using X-ray at Aarhus University Hospital and their careers in their respective nursing homes, who answered the questionnaire.

2.3. Development of the Questionnaire

2.3.1. Evaluation of the Pilot Project Mobile X-Ray

In 2015, we conducted an evaluation of mobile X-ray, where we measured satisfaction using self-developed questionnaires for patients, relatives and healthcare

staff. The items were formulated using knowledge from the literature and observations from our own project [2] [5] [7] [8] [9] [15] [16] [20]. In the evaluation, we concluded that the questionnaires needed to be further developed [9]. The further development of the questionnaire was based on observation studies and interviews to develop the questions.

2.3.2. Observation and Interview Study

Observation studies of 10 patients (selected patients who were examined with mobile X-ray or X-ray at the hospital) and interview studies of 10 different healthcare staff, four patients and two healthcare staff were conducted to gain knowledge to further the development of the existing questions. In that process, we found that relatives did not participate in the examination as often as we thought. Many of the patients were too fragile to answer questions concerning satisfaction.

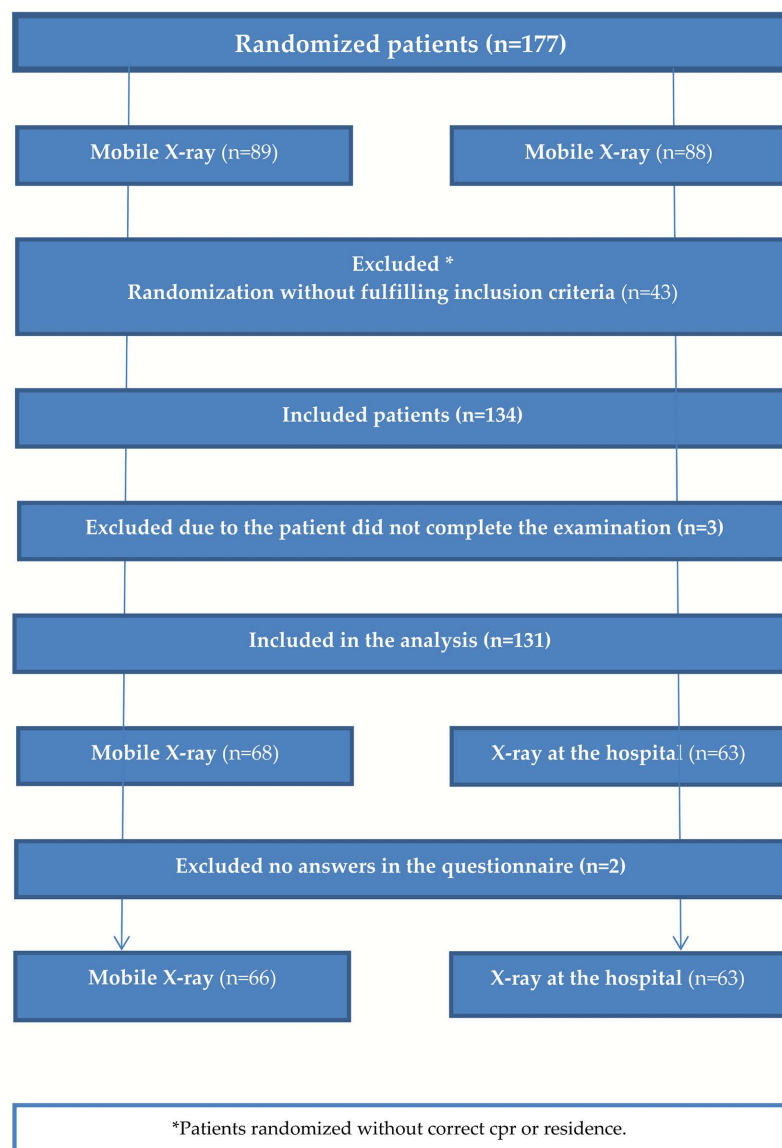


Figure 1. Patient inclusion flow.

2.3.3. The Questionnaire

From the knowledge gained in the observation and interview studies, we decided to develop a questionnaire for patients, where healthcare staff would be asked to answer on their behalf. We used the knowledge gained from the evaluation, literature, observations and interviews to develop new questionnaires for patients, relatives and healthcare staff [2] [6] [7] [8] [9] [15]. This resulted in 13 questions.

A pilot was conducted with 10 participants including both patients and staff. We tested the questionnaire using both a binary yes/no answer category and Likert style scale. The pilot confirmed that patients were not able to answer questions concerning the examinations. The response from the majority of healthcare staff was that answers should be expressed on a scale. None had time for writing comments. We ended up with five different answer categories and included 13 questions related to patient experience for patients and one question related to healthcare experience for healthcare staff. In the questionnaire, patients are called citizens because this is the term used by nursing homes in Aarhus Municipality. After the pilot, the final questionnaire was tested on five random healthcare staff members and afterwards, we conducted the study [21] [22].

2.3.4. Themes in the Questionnaire

In order to analyze satisfaction and understand mobile X-ray, we categorized the questions into themes inspired by the literature and from our own observations, interviews and pilot study [2] [7] [8] [9] [15]. The answers to questions 1 - 3 expressed overall satisfaction with X-ray in general. Questions 4 - 9 were about satisfaction with the X-ray examination. Questions 10 - 12 were about satisfaction concerning circumstances after the X-ray examination and question 13 dealt with the possible mental effects following the patient's X-ray examination.

2.3.5. Data Collection

The data collector in the observation study, interview study and the questionnaire pilot was the same researcher. This researcher also administered the questionnaire, which healthcare staff answered. The researcher developed the observation guide, interview guide and questionnaires in cooperation with the supervisors and staff at the Department of Radiology.

The data of the final questionnaire were collected by a data collector trained for the purpose. Before the data collection started, the data collector was trained in using the questionnaire on a similar study population. The data collector had no interest in the final results.

The data collector collected data within a week after the X-ray examination in the patients' homes.

2.4. Statistical Analysis

The statistical comparison of each question in the questionnaire data was done using Fisher's exact test to determine if there were nonrandom associations between the intervention group and the control group. We used this test because Fish-

er's exact test allows values below 5, which was the case in all questions [23]. The analysis was performed on single items and not on scale items. The analysis was performed as treated and not intention to treat because of missing after the randomization. The intervention group was the explanatory variable and a two-sided P-value below 0.05 was considered as an indicator of statistical significance. We gave the answers values in order to conduct the statistical analysis. The answer "extremely" had the value of 1, "quite a bit" 2, "slightly" 3, "not at all" 4 and "do not know" 5. The value of 5 was excluded in the statistical analysis, but the answers are shown in **Table 1**. The reason for exclusion of "do not know" was that this answer had the value of 5. This value may point at an unintended meaning in the analysis as we do not know what value the respondent would have given when the other categories are categorical. The answer "do not know" is not a missing value, because no one answered "do not know" in all questions for a patient.

3. Results

The results in **Table 1** show that patients living in aged care facilities in Aarhus Municipality asked by proxy were significantly more satisfied with being examined by mobile X-ray (intervention) in their own homes than having an X-ray at the hospital (control). All results were significant, but those with the highest effect size were question four, where 92% in the mobile X-ray group vs. 60% in the X-ray at the hospital group experienced an extremely respectful examination. Also in question seven, 92% in the mobile X-ray group vs. 40% in the X-ray at the hospital group felt extremely safe in the surroundings where the examination was performed.

The responses of healthcare staff about patients' overall satisfaction showed that 85% of the patients in the mobile X-ray group and 27% of the patients in the X-ray at the hospital group were extremely satisfied. In response to whether the patient was satisfied, the results from healthcare staff show that 89% of the mobile X-ray group and 35% of the X-ray at the hospital group were satisfied.

The clinical meaningfulness of the differences in the results is that both healthcare staff and patients have a higher level of satisfaction, when the patient is examined at home. However, at the same time we do not have documentation over whether the significant difference in patient satisfaction impacts patient treatment outcomes.

4. Discussion

The collected data of the questionnaire we developed showed a significantly higher level of satisfaction with mobile X-ray compared to X-ray at the hospital in all questions.

Ricauda *et al.* also studied patient satisfaction with mobile X-ray and found that 49% of patients reported that satisfaction with mobile X-ray was very good or excellent. This result is in accordance with our study of patient satisfaction

Table 1. Patient satisfaction measured using a self-developed questionnaire tested by using Fisher's exact test (n = 129).

Questions	Examination type	Extremely	Quite a bit	Slightly	Not at all	Don't know	P-value
1. Were you as staff overall satisfied with the patient care?	Mobile X-ray (n = 66)	56	1	1	0	8	p < 0.01
	X-ray at the hospital (n = 63)	17	35	2	0	9	
2. Was the citizen overall satisfied with the x ray examination?	Mobile X-ray	59	3	0	0	4	p < 0.01
	X-ray at the hospital	22	29	5	0	7	
3. Was the citizen overall satisfied with the patient care?	Mobile X-ray	58	4	0	0	4	p < 0.01
	X-ray at the hospital	13	24	19	0	7	
4. Did the citizen experience a respectful examination?	Mobile X-ray	61	1	0	0	4	p < 0.01
	X-ray at the hospital	38	18	0	0	7	
5. Did the citizen feel safe during the x-ray examination?	Mobile X-ray	58	4	0	0	4	p < 0.01
	X-ray at the hospital	29	21	6	0	7	
6. Was the examination adapted to the citizen's needs?	Mobile X-ray	59	2	1	0	4	p < 0.01
	X-ray at the hospital	10	12	35	0	6	
7. Did the citizen feel safe in the surroundings where the examination was performed?	Mobile X-ray	61	0	0	1	4	p < 0.01
	X-ray at the hospital	25	21	11	0	7	
8. Did the citizen experience discomfort and pain during the X-ray examination?	Mobile X-ray	2	2	10	48	4	p < 0.01
	X-ray at the hospital	1	8	21	22	9	
9. Did the citizen experience worries during the X-ray examination?	Mobile X-ray	1	0	5	56	0	p < 0.01
	X-ray at the hospital	2	13	14	24	10	
10. Was the citizen satisfied with the information about the X-ray examination?	Mobile X-ray	58	1	1	2	4	p < 0.01
	X-ray at the hospital	37	19	1	0	6	
11. Was the citizen satisfied with the involvement in the following treatment?	Mobile X-ray	58	3	1	0	4	*p0.026
	X-ray at the hospital	44	11	2	0	6	
12. Was the citizen satisfied with the wait time associated with the X-ray examination?	Mobile X-ray	57	0	3	2	4	p < 0.01
	X-ray at the hospital	10	10	31	6	6	
13. Was the citizen more uneasy after the X-ray examination?	Mobile X-ray	2	0	0	57	7	p < 0.01
	X-ray at the hospital	0	13	11	24	15	

* P-value below 0.05 determines statistical significant differences between the intervention and control group.

[7]. Eklund and colleagues studied satisfaction with mobile X-ray and found that both patients and healthcare staff members had positive experiences with mobile X-ray. Of the 123 patients included in their feasibility study, 62 patients were able to answer the questions and none gave a negative response [2]. Unfortunately, the authors did not describe why only half of the patients answered. It might be the healthiest patients who were able to answer, which could result in a positive bias

in favor of mobile X-ray. In our RCT studying the effect of mobile X-ray on hospitalizations as the primary outcome, we experienced missing values in the cognitive test with patients, because they were very ill and fragile [16]. Therefore, it seems to be the best choice to have healthcare staff answering on behalf of the patients due to the otherwise expected low response rate.

To our knowledge, this RCT is the first to measure the satisfaction of patients examined with mobile X-ray outside the hospital compared with patients examined with X-ray at the hospital. Our aim was to measure satisfaction from the patient's point of view. We wanted to examine whether patients offered mobile X-ray are equally or more satisfied than patients offered X-ray at the hospital.

High satisfaction with mobile X-ray is well known in other non-RCTs. The main strength of our study is that we were able to measure the satisfaction of aged care facility patients; in this patient group it is difficult to measure satisfaction due to the large number of patients who are frail and have cognitive impairments. We measured satisfaction using a questionnaire, but the questionnaire may need to be further developed in order to better differentiate between the patient groups, because in general all answers were positive. It might be preferable to use another scale in the answer categories, because it could be easier for patients to choose between yes or no. We only had three non-respondents due to the patient not completing the examination and a response rate of 98% from healthcare staff. The positive result and high response rate could be an expression of healthcare staff finding it important to examine the patient with X-ray, because aged care facility patients in our study are so frail [16]. The result was extremely dependent on the willingness of healthcare staff and them having time to participate, but it is our opinion that the healthcare staff is the ones who have the best contact with the patient.

It was not possible to measure satisfaction by asking the patients and therefore the results might reflect the healthcare staff's satisfaction rather than patient satisfaction. However, healthcare staff was asked to answer from the patient's point of view and using this method was the only possibility of measuring patient satisfaction. Therefore, in our opinion this was the best way to guarantee the scientificity and reliability of the study.

It was well known in Aarhus Municipality that mobile X-ray was a pilot project and in measuring satisfaction based on healthcare staff, the results may have led to bias towards positive statements about mobile X-ray in order for the project to continue. If mobile X-ray were not to be offered, the patients in the aged care facilities may not be examined with X-ray at all, which may result in a treatment encumbered with uncertainty. Studies report that when mobile X-ray is offered, more patients are X-ray examined, leading to further treatment and prevention of hospitalization [8] [24]. If healthcare staff members were unsatisfied, it could result in mobile X-ray not being offered any more. Kjelle *et al.* studied satisfaction in implementing mobile X-ray in nursing homes and found that healthcare staff only had positive experiences [25]. We experienced the same in our interview study, where healthcare staff reported that it eased the work day by not having to

administer and coordinate the examination, including transporting the patient to the hospital. The same result was found by Thingsen *et al.* in their qualitative interview study of expectations when implementing mobile X-ray in nursing homes [6]. We are aware that the positive response from healthcare staff could reflect bias in order to keep mobile X-ray going as part of the existing health services for a very vulnerable patient group, but on the other hand, the positive result may also reflect mobile X-ray being a good alternative for frail patients and healthcare staff.

5. Conclusion and Prospect

Our questionnaire study shows that healthcare staff answering on behalf of frail patients thought that the patients were significantly more satisfied at being examined by mobile X-ray in their home than having an X-ray at the hospital. This is relevant to clinical practice, because the X-ray examination is adapted to the patients' needs and the patients are more satisfied being examined at home compared to being examined at the hospital.

Recommendation for Further Research

Our recommendation for further research is to directly study the satisfaction with mobile X-ray from the patients' point of view, because satisfaction might influence the treatment of the patient.

6. Ethical Approval and Consent to Participate

The study was approved by the Ethical Committee (53 811) and Data protection system (1-16-02-124-15) in the Central Denmark Region and registered in Clinicaltrials.gov (NCT04005040). Involved Departments at Aarhus University Hospital gave their consent for looking in the Electronic Patient Journal (EPJ).

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Dozet, A., Ivarsson, B., Eklund, K., Klefsgard, R. and Geijer, M. (2016) Radiography on Wheels Arrives to Nursing Homes—An Economic Assessment of a New Health

- Care Technology in Southern Sweden. *Journal of Evaluation in Clinical Practice*, **22**, 994-1001. <https://doi.org/10.1111/jep.12590>
- [2] Eklund, K., Klefsgard, R., Ivarsson, B. and Geijer, M. (2012) Positive Experience of a Mobile Radiography Service in Nursing Homes. *Gerontology*, **58**, 107-111. <https://doi.org/10.1159/000329452>
- [3] Graverholt, B., Forsetlund, L. and Jamtvedt, G. (2014) Reducing Hospital Admissions from Nursing Homes: A Systematic Review. *BMC Health Services Research*, **14**, Article No. 36. <https://doi.org/10.1186/1472-6963-14-36>
- [4] Kihlgren, A.L., Nilsson, M., Skovdahl, K., Palmblad, B. and Wimo, A. (2004) Older Patients Awaiting Emergency Department Treatment. *Scandinavian Journal of Caring Sciences*, **18**, 169-176. <https://doi.org/10.1111/j.1471-6712.2004.00266.x>
- [5] Montalto, M., Shay, S. and Le, A. (2015) Evaluation of a Mobile X-Ray Service for Elderly Residents of Residential Aged Care Facilities. *Australian Health Review: A Publication of the Australian Hospital Association*, **39**, 517-521. <https://doi.org/10.1071/AH15059>
- [6] Thingnes, E.R. and Stalsberg, R. (2010) Kvalitative aspekter ved innføring av mobile røntgentjenester til sykehjem. En studie av tre faggruppers forventninger [Qualitative Aspects on Establishing Mobile Radiography Services for Nursing Homes. A Study of Three Professional Groups Expectations]. *Nordisk Tidsskrift for Helseforskning*, **6**, 14-28. <https://doi.org/10.7557/14.1181>
- [7] Ricauda, N.A., Tibaldi, V., Bertone, P., Quagliotti, E., Tizzani, A., Zanicchi, M., *et al.* (2011) The RAD-HOME Project: A Pilot Study of Home Delivery of Radiology Services. *Archives of Internal Medicine*, **171**, 1678-1680. <https://doi.org/10.1001/archinternmed.2011.336>
- [8] Vigeland, E., Bohm, R.E., Rostad, A. and Lysdahl, K.B. (2017) Mobile X-Ray Service for Nursing Homes. *Tidsskrift for den Norske Laegeforening*, **137**, 198-202. <https://doi.org/10.4045/tidsskr.16.0035>
- [9] Toppenberg, M.D. and Kjeldsen, A.S. (2016) Evaluation of the Pilot Project Mobile X-Ray at the Department of Radiology, Aarhus University Hospital. *Klinisk Sygepleje*, **30**, 208-220. <https://doi.org/10.18261/issn.1903-2285-2016-03-06>
- [10] Xiao, H. and Barber, J.P. (2008) The Effect of Perceived Health Status on Patient Satisfaction. *Value in Health*, **11**, 719-725. <https://doi.org/10.1111/j.1524-4733.2007.00294.x>
- [11] Woodward, S., Berry, K. and Bucci, S. (2017) A Systematic Review of Factors Associated with Service User Satisfaction with Psychiatric Inpatient Services. *Journal of Psychiatric Research*, **92**, 81-93. <https://doi.org/10.1016/j.jpsychires.2017.03.020>
- [12] Delbanco, T.L. (1996) Quality of Care through the Patient's Eyes. *British Medical Journal*, **313**, 832-833. <https://doi.org/10.1136/bmj.313.7061.832>
- [13] Dyer, N., Sorra, J.S., Smith, S.A., Cleary, P.D. and Hays, R.D. (2012) Psychometric Properties of the Consumer Assessment of Healthcare Providers and Systems (CAHPS(R)) Clinician and Group Adult Visit Survey. *Medical Care*, **50**, S28-S34. <https://doi.org/10.1097/MLR.0b013e31826cbc0d>
- [14] Sixma, H.J., Kerssens, J.J., Campen, C.V. and Peters, L. (1998) Quality of Care from the Patients' Perspective: From Theoretical Concept to a New Measuring Instrument. *Health Expectations*, **1**, 82-95. <https://doi.org/10.1046/j.1369-6513.1998.00004.x>
- [15] Kjelle, E. and Lysdahl, K.B. (2017) Mobile Radiography Services in Nursing Homes: A Systematic Review of Residents' and Societal Outcomes. *BMC Health Services Research*, **17**, Article No. 231. <https://doi.org/10.1186/s12913-017-2173-8>
- [16] Toppenberg, M., Christiansen, T., Rasmussen, F., Nielsen, C. and Damsgaard, E.M.

- (2020) Mobile X-Ray outside the Hospital vs. X-Ray at the Hospital Challenges Exposed in an Explorative RCT Study. *Healthcare*, **8**, Article No. 118.
- [17] Kane, R.L., Kane, R.A., Bershadsky, B., Degenholtz, H., Kling, K., Totten, A., *et al.* (2005) Proxy Sources for Information on Nursing Home Residents' Quality of Life. *The Journals of Gerontology: Series B*, **60**, S318-S325. <https://doi.org/10.1093/geronb/60.6.S318>
- [18] Usman, A., Lewis, S., Hinsliff-Smith, K., Long, A., Housley, G., Jordan, J., *et al.* (2018) Measuring Health-Related Quality of Life of Care Home Residents, Comparison of Self-Report with Staff Proxy Responses for EQ-5D-5L and HowRu: Protocol for Assessing Proxy Reliability in Care Home Outcome Testing. *BMJ Open*, **8**, e022127. <https://doi.org/10.1136/bmjopen-2018-022127>
- [19] Usman, A., Lewis, S., Hinsliff-Smith, K., Long, A., Housley, G., Jordan, J., *et al.* (2019) Measuring Health-Related Quality of Life of Care Home Residents: Comparison of Self-Report with Staff Proxy Responses. *Age and Ageing*, **48**, 407-413. <https://doi.org/10.1093/ageing/afy191>
- [20] Toppenberg, M.D., Christiansen, T.E.M., Rasmussen, F., Nielsen, C.P. and Damsgaard, E.M. (2020) Mobile X-Ray outside the Hospital: A Scoping Review. *BMC Health Services Research*, **20**, Article No. 767. <https://doi.org/10.1186/s12913-020-05564-0>
- [21] Bryman, A. (2016) *Social Research Methods*. 5th Edition, Oxford University Press, Oxford.
- [22] de Vet, H.C.W., Terwee, C.B., Mokkink, L.B. and Knol, D.L. (2011) *Measurement in Medicine: A Practical Guide*. Cambridge University Press, Cambridge. <https://doi.org/10.1017/CBO9780511996214>
- [23] Kirkwood, B. and Sterne, J. (2003) *Essential Medical Statistics*. 2nd Edition, Blackwell Science Inc., Hoboken.
- [24] Price, S. and Summers, R. (2006) Mobile Healthcare in the Home Environment. 2006 *International Conference of the IEEE Engineering in Medicine and Biology Society*, New York, 30 August-3 September 2006, 6446-6448. <https://doi.org/10.1109/IEMBS.2006.260722>
- [25] Kjelle, E., Lysdahl, K.B., Olerud, H.M. and Myklebust, A.M. (2018) Managers' Experience of Success Criteria and Barriers to Implementing Mobile Radiography Services in Nursing Homes in Norway: A Qualitative Study. *BMC Health Services Research*, **18**, Article No. 301. <https://doi.org/10.1186/s12913-018-3115-9>