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Original Study

Treatment of Cardiovascular Diseases Among Elderly Residents of Long-term Care Facilities

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A B S T R A C T

Background: The prevalence of cardiovascular diseases among nursing home residents is high but little is known whether pharmacologic therapy recommended by actual medication guidelines is followed by facility's staff.
Aim: To evaluate the adherence to actual guidelines for treatment of cardiovascular diseases among older adult residents of long-term care (LTC) facilities.
Material and methods: The cross-sectional study was performed from December 2009 to November 2010 among 189 elderly residents aged ≥60 years in 3 LTC facilities in Poland: 1 long-term care hospital (LTCH) and 2 nursing homes (NHs). The initial evaluation included analysis of medical documentation (all diagnosed diseases and used drugs), blood pressure (BP) measurements and performance of Mini Nutritional Assessment Short-Form (MNA-SF), Abbreviated Mental Test Score (AMTS), Activities of Daily Living (ADL) score, and Barthel Index. Prescribed medication for hypertension (HT), heart failure (HF), and coronary heart disease (CHD) were compared to current European Cardiology Society (ESC), and European Society of Hypertension (ESH) medication guidelines. Residents were divided into 3 subgroups: with HT, HF, and CHD. Results were presented as means and standard deviation. Groups were compared using Mann-Whitney *U* test for nonparametric data and chi-square test to assess differences in distribution of categorical variables. *P* values <.05 were considered statistically significant.
Results: CHD was diagnosed among 114 residents (60.3%) but only 60.5% of them were treated with aspirin (ASA), 45.6% with beta-blockers (BBs), 60.5% with angiotensin-converting enzyme inhibitor (ACEI), and 24.6% with statins. HF observed in 75% of cases was treated by using ACEI (54.7%), BBs (45.3%), loop diuretics (LDs, 36%), mineralocorticoid-receptor antagonists (MRAs, 21.3%). HT was diagnosed among 98 study participants (51.9%) and in the majority of cases (76.6%) was well controlled (mean BP: 133.7 ± 17.6/73.8 ± 10.2 mmHg). The most popular antihypertensive drugs were ACEIs (77.6%), BBs (40.8%) and calcium channel blockers (CCBs, 26.5%) whereas thiazides, alpha-blockers (ABs), and angiotensin receptor blockers (ARBs) were used less frequently.
Conclusion: In summary, the study showed that insufficient treatment of cardiovascular diseases among elderly residents of LTC facilities could be a potential risk factor of poor prognosis.

Cardiovascular diseases (CVDs) are the leading major cause of morbidity, disability, hospitalization, and mortality among older adults not only in Europe but also in other continents.[1] WHO indicated that more people die annually from CVD than from any other cause.[2] According to European Cardiovascular Disease Statistics (2017), each year CVD causes about 3.9 million deaths in Europe (45% of all deaths).[3] These facts could be motivation for experts to create and provide the guidelines for how cardiovascular diseases should be treated among different age groups, including nursing home

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residents. In fact, the elderly population seems to be the most difficult group to manage because of their multimorbidity and polypharmacy. A retrospective cross-sectional study of 2707 elderly home care patients revealed that inappropriate medication prescription based on Beers Criteria oscillated from 5.8% in Western Europe to 41.1% in Eastern Europe.[4] The similar situation was noted in United States among elderly patients receiving home health care—the prevalence of potentially inappropriate medications (PIMs) was also high (38%) and polypharmacy was associated with an increased risk of PIM use.[5] The worst statistics concerning PIM phenomenon came from nursing homes: 10.5% to 54.7%.[6]

The recent expert opinion of the European Society of Hypertension–European Union Geriatric Medicine Society (ESH-EUGMS) Working Group suggested that antihypertensive treatment among frail, very old patients should be individualized and that the frailty and clinical status should be monitored on a frequent basis.[7] It was the first official document to present the management of hypertension (HT) in very old, frail subjects. Unfortunately, there is still a lot of controversy and missing data on how institutionalized geriatric population should be treated. There are no available guidelines or algorithms for management of cardiovascular diseases in institutionalized settings. Residents of long-term care (LTC) facilities are the specific target group often disabled, frail, with cognitive impairment, chronic disabling diseases, malnourished and with impairments in activities of daily living so there are difficulties in recruiting study participants from this kind of population.[8] These factors could make cardiovascular treatment difficult to choose for doctors and to adopt by their patients. A systematic review of observational studies performed by Welsh et al characterized these populations as follows: the majority of nursing home residents are female (71%) and in the mean age of 82 years with a high prevalence of comorbidity: coronary heart disease (CHD, 25%), HT (16%-71%), cerebrovascular disease (28%), diabetes mellitus (23%), dementia (39%), and experiencing falls (32%).[9] However, there was a gap in the literature concerning the appropriate treatment of cardiovascular diseases among elderly residents of LTC facilities. The main aim of this article was to estimate the adherence to actual guidelines for treatment of cardiovascular diseases among elderly residents of LTC facilities.

Material and Methods

Study Design

The cross-sectional study was performed from December 2009 to November 2010 among elderly residents aged 60 years and older in 3 LTC facilities in Poland: 1 long-term care hospital (LTCH) and 2 nursing homes (NHs). The inclusion criteria was written informed consent. Subjects cognitively disabled were excluded from the analysis. The study protocol included the initial health assessment of the study participant: socio-demographic, medical and functional status. The study protocol was approved by the local ethics committee at the Jagiellonian University and conformed to the guidelines set forth by the Declaration of Helsinki and by managements of chosen institutions. Medical documentation was used to extract information about all diagnosed diseases (presence of HT, CHD, heart failure [HF], other comorbidities) and all applied medicines (beta-blockers [BBs], alpha-blockers, angiotensin-converting enzyme inhibitor [ACEI], angiotensin receptor blocker, calcium channel blocker [CCB], loop diuretics, thiazides, mineralocorticoid-receptor antagonists, aspirin [ASA], digoxin, statins, other). Prescribed medication for HT, HF, and CHD were compared to current European Cardiology Society (ESC) and European Society of Hypertension (ESH) medication guidelines.[10,11] The initial clinical evaluation and all study measurements included blood pressure (BP), weight and height, and malnutrition risk; functional and cognitive assessments were performed by the trained qualified nursing staff of each setting. Two measurements of blood pressure were conducted at the upper arm in a sitting position using oscillometric devices, and HT was defined as HT history, taking antihypertensive treatment, or when BP values obtained were ≥140 and/or 90 mmHg during study examination. Malnutrition risk was estimated using a validated nutrition screening tool, that is, the Mini Nutritional Assessment Short-Form (MNA-SF scores: 0-14).[12] According to this scale, malnutrition was diagnosed at 0 to 7 points, risk of malnutrition at 8 to 11 points, and the normal nutritional status at 12 to 14 points. The possibility of dementia among study participants[13] was estimated using the Abbreviated Mental Test Score (AMTS scores: 0-10). Severe cognitive impairment was diagnosed at 0 to 3 points, moderate cognitive impairment at 4 to 6 points, and normal mental status at >6 points. Katz Index of Independence in Activities of Daily Living (ADL score: 0-6) was used to assess performance in the 6 functions of bathing, dressing, toileting, transferring, continence, and feeding.[14] The Barthel Index (scores: 0-100) was used to evaluate disability/dependence in activities of daily living including presence or absence of fecal and urinary incontinence, help needed with grooming, toilet use, feeding, transfers, walking, dressing, climbing stairs, and bathing.[15] Results obtained from residents of LTCH and NH were compared.

Statistical Analysis

Descriptive statistics was based on the mean and standard deviation. Comparative statistics in groups was performed using the Mann-Whitney *U* test for nonparametric data and chi-square test to assess differences in distribution of categorical variables between groups. *P* values of <.05 were considered statistically significant. Statistical analysis was performed using Statistica 10.

Results

The analyzed sample consisted of 189 elderly residents (103 of LTCH and 86 of NHs), white race, majority women (61.4%), and average age 76.3 ± 11.2 years, with mean MNA-SF scores of 10.4 ± 2.5 and AMTS scores of 6.5 ± 3.1 points. The mean value of the Activities of Daily Living score was 2.9 ± 2.7, and the Barthel Index score was 45.3 ± 38.5 whereas the average values of systolic and diastolic BPs were 127.4 ± 18.7 mmHg and 71.8 ± 10.9 mmHg, respectively. Study participants had 4 or more diagnosed diseases and took 6 or more prescribed medicines. The general characteristics and the comparison between long-term care hospital and nursing home residents are presented in the Table 1.

The prevalence of cardiovascular diseases was analyzed among all study participants (Figure 1) and the frequency distribution of HT,

Table 1
Demographic and Clinical Characterisitics of LTCH and NH Residents

Variable	LTCH + NH (n = 189)	LTCH (n = 103)	NH (n = 86)
Age, years	76.3 ± 11.2	76.5 ± 11.8	76.2 ± 10.5
Men, %	38.6	34.0	44.2
MNA, score	10.4 ± 2.5	9.8 ± 2.9	11.1 ± 2.9***
AMTS, score	6.5 ± 3.1	6.5 ± 3.4	6.6 ± 2.7
ADL, score	2.9 ± 2.7	1.4 ± 1.9	4.7 ± 2.0***
Barthel Index, score	45.3 ± 38.5	19.3 ± 17.3	76.5 ± 33.5***
Systolic BP, mmHg	127.4 ± 18.7	120.2 ± 13.9	135.9 ± 20.0***
Diastolic BP, mmHg	71.8 ± 10.9	69.4 ± 10.7	74.6 ± 10.7**
Number of drugs	6.6 ± 3.5	7.0 ± 3.3	6.1 ± 3.6*
Number of chronic diseases	4.1 ± 1.8	4.0 ± 1.8	4.2 ± 1.8

ADL, Activities of Daily Living score.
Data are presented as means ± standard deviations or numbers (percentages).
*$P < .05$; **$P < .01$; ***$P < .001$.

CHD, and HF among both LTC hospital and NH residents is presented in Figure 2.

Furthermore, residents were divided into 3 subgroups: residents with HT (Table 2; Figure 3), residents with heart failure (Table 3; Figure 4), and residents with coronary heart disease (Table 4; Figure 5). All these subgroups were described separately using general characteristics and percentage of medicines taken. A comparison of 2 different settings (LTCH, NH) in relation to the analyzed subgroups is also presented.

CHD was diagnosed among 114 residents (60.3%) but only 60.5% of them were treated with aspirin (ASA), 45.6% with BBs, 60.5% with ACEI, and 24.6% with statins. HF observed in 75% of cases was treated by using ACEI (54.7%), BB (45.3%), loop diuretics (36%), mineralocorticoid-receptor antagonists (21.3%). Hypertension was diagnosed among 98 study participants (51.9%) and in the majority of cases (76.6%) was well controlled (mean BP: 133.7 ± 17.6/73.8 ± 10.2 mmHg). The most popular antihypertensive drugs were ACEI (77.6%), BBs (40.8%), and CCB (26.5%), while thiazides, alpha-blockers, and angiotensin receptor blockers were used less frequently.

Discussion

Hypertension

The study showed that patients with HT were aged 80.2 (LTCH) versus 77.7 (NH) years old and were treated mostly using ACEI (72.7% vs 81.5%, respectively), BB (34.1% vs 46.3%), or CCB (29.5% vs 24.1%). According to ESH/ESC 2013[10] guidelines and ESH-EUGMS Working Group Expert Opinion,[7] HT among octogenarians should be managed by ACEI, thiazides, or CCB. In fact, all available guidelines are based mostly on one trial, the Hypertension in the Very Elderly Trial (HYVET), which was performed among octogenarians with HT. HYVET proved that indapamide (a thiazide) supplemented, if necessary, by perindopril (an ACEI) led to significant reduction in major cardiovascular events and all-cause mortality by aiming at systolic blood pressure (SBP) values <150 mmHg. In our study, thiazides were used more often in nursing homes (25.9%) rather than LTCH (9.1%). However, HYVET's findings should not be recommended to adopt in the group of ill and frail individuals because in the HYVET trial, patients were recruited only if they were in good physical and mental condition, which is not typical of institutionalized patients.

BBs are a group of antihypertensive drugs that are still prescribed as hypertensive drugs, but most guidance no longer recommends them for the treatment of HT and favors the use of CCBs.[9] Despite this fact, the rise in their use was observed over the years among care home residents.[9] ESH/ESC 2013 and ESH-EUGMS Working Group Expert Opinion guidelines recommend using beta blockers only when there are such cofactors as HF, CHD, or myocardial infarction.[7,10] It was noted that older patients could have a higher risk of adverse effects on BB medication in comparison to younger population.[16]

There are still many controversial aspects of antihypertensive treatment but experts suggest that the final decision of antihypertensive therapy among frail elderly people/patients should be made by the treating physician and should be based on monitoring of the clinical effects of treatment.[10] The recently published Systolic Blood Pressure Intervention Trial (SPRINT)[17] revealed that targeting SBP of 120 mmHg among patients at high cardiovascular risk (it was also statistically significant in the subgroup of patients >75 years old) resulted in reduction of major cardiovascular events and mortality. However, these findings were not proven in the population of octogenarians (in this study, there was no exact information about the number of patients aged >80 years). Furthermore, the aggressive treatment performed in SPRINT resulted in side effects and an increase in incidence of hypotension, dyselectrolytemia, syncope, or renal failure was observed.[7] As far as treatment goals are concerned, it is said that antihypertensive treatment should be reduced or even stopped if SBP is lowered below 130 mmHg in octogenarians, and the safety levels of SBP values are 150 to 130 mmHg.[7,18]

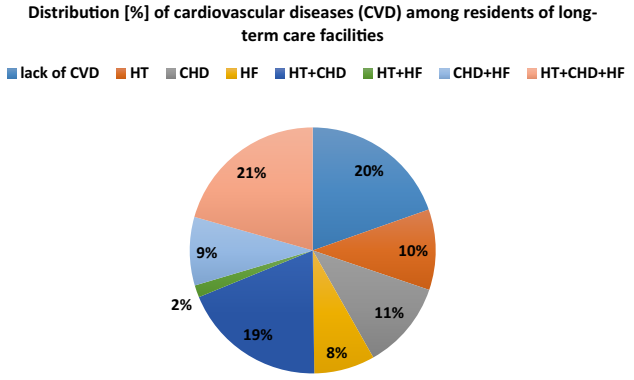

Fig. 1. Distribution (%) of CVDs among residents of LTC facilities.

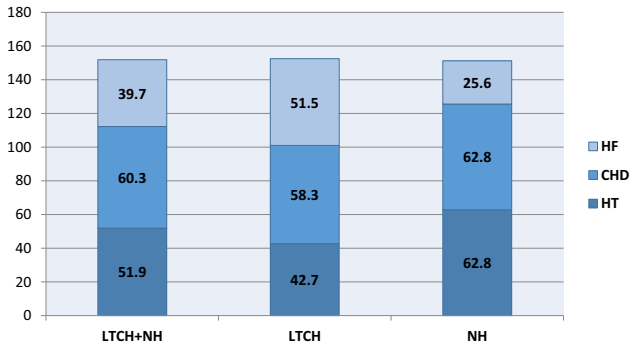

Fig. 2. Frequency (%) of HT, CHD, and HF among residents of LTCH and NH.

Heart Failure

The prevalence of heart failure among nursing home residents is high (vary from 33% to 45%) but many residents still remain undiagnosed.[19,20] The proper treatment of HF may reduce symptoms and improve quality of life but may not lead to lower mortality or hospitalization.[21] According to the 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure,[22] HF should be managed using both nonpharmacologic and pharmacologic methods.[23–26] The elderly should be treated in the same way as other age groups but the pharmacologic choice should depend on the type of HF

Table 2
General Characteristics of Residents With HT

Variable	LTCH (n = 44)	NH (n = 54)
Age, years	80.2 ± 9.0	77.7 ± 8.6
MNA, score	10.5 ± 2.8	11.2 ± 3.1
AMTS, score	6.6 ± 3.5	6.8 ± 2.6
ADL, score	1.3 ± 2.2	4.6 ± 2.1***
Barthel Index, score	21.8 ± 18.8	74.4 ± 34.5***
Systolic BP, mmHg	126.4 ± 12.7	139.5 ± 18.8***
Diastolic BP, mmHg	72.1 ± 10.4	75.1 ± 9.9
Number of drugs	7.2 ± 3.4	6.7 ± 3.6
Number of chronic diseases	5.1 ± 1.7	4.7 ± 1.6
BP ≥ 140/90 mmHg, %	6.8	45.3***

ADL, Activities of Daily Living score.
Data are presented as means ± standard deviations or numbers (percentages).
***$P < .001$.

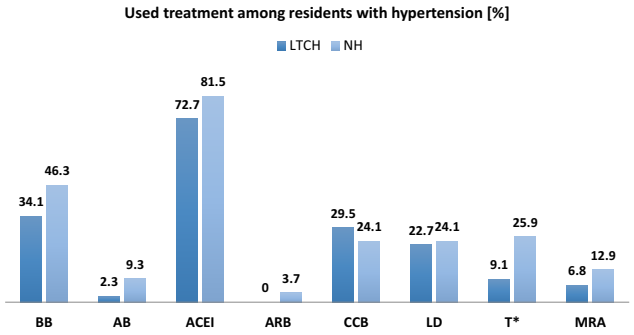

Fig. 3. Treatment used among residents with HT (%). *$P < .05$. (AB, alpha-blockers; ARB, angiotensin receptor blocker; LD, loop diuretics; MRAs, mineralocorticoid-receptor antagonists; T, thiazides.)

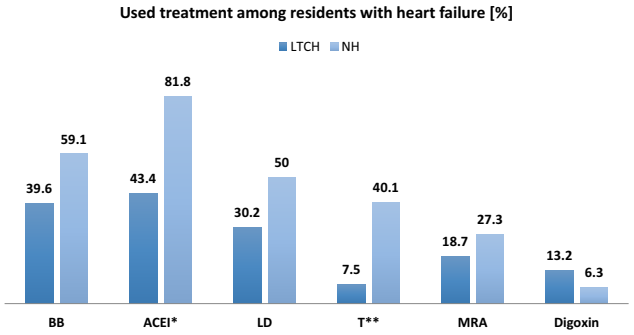

Fig. 4. Treatment used among residents with HF (%). *$P < .01$; **$P < .001$. (LD, loop diuretics; MRA, mineralocorticoid-receptor antagonists; T, thiazides.)

and the measurement of left ventricular ejection fraction (LVEF). Patients with reduced LVEF should be treated with ACEI and BB; and diuretics should be used to control fluid overload. Patients with preserved LVEF should control symptoms and underlying diseases.[21] Our study showed that residents with HF were aged 80.8 (LTCH) versus 78.0 (NH) years and were treated mostly by ACEI (43.4% vs 81.8%, respectively), BBs (39.6% vs 59.1%), and LDs (30.2% vs 50%). Our findings proved that adequate treatment of HF was used less frequently in LTCHs rather than in NHs. The possible reason for this underuse may be the greater risk for adverse drug reactions due to renal dysfunction or polypharmacy among the elderly. However, heart failure is the most common cause of hospitalization for older adults (>65 years), so the adequate treatment of this age group could be beneficial in preventing exacerbation of the disease.[27]

The recent cross-sectional study performed in the Netherlands concerning the treatment of HF among nursing home residents revealed that either the recommended therapy of HF was not prescribed or the dose was inappropriate.[21] The fact that nursing home residents with HF did not receive pharmacologic treatment according to the guidelines was also proven in the review of Litaker et al[28] and other studies performed in Poland, Sweden, or United States.[29–31]

Furthermore, Daamen et al[21] observed that non-pharmacologic interventions recommended by guidelines were not performed among institutionalized patients despite the fact that the positive impact on symptoms and prognosis of this kind of method was proven.[32,33] In our study, the adherence to nonpharmacologic interventions like exercise training, dietary, and lifestyle advice was not analyzed, which also could be regarded as a weak point of our study.

The aspect of frailty is observed among 70% of octogenarians with HF.[34] Guidelines recommend performing frailty assessment to select individuals with high frailty score to provide them specialist care and appropriate follow-up. Frailty should be monitored, and potential reversible causes should be excluded. Experts indicate that the quality of life is the most important thing among the frail elderly population, so the timing and dose of diuretics should be changed to decrease the risk of incontinence. Polypharmacy should be reduced, and doses of HF medication should be optimized. In addition, drugs without an immediate effect on symptom relief, for example, statins, could be stopped.[22]

Coronary Heart Disease

It is estimated that 81% of deaths caused by coronary heart diseases were recorded in people aged ≥65 years, so appropriate treatment seems to play a crucial role in cardio-prevention.[35] Our study revealed that residents with coronary heart disease were aged 81.2 (LTCH) versus 78.1 (NH) years and were treated using ASA (68.3% vs 51.8%, respectively), ACEI (56.7% vs 64.8%), and BBs (41.7% vs 50%). However, statins were used only in 8.3% among LTCH residents whereas this drug class was commonly used among NH residents (42.6%). On the other hand, only half of the NH residents were taking ASA whereas this drug was the most common option among LTCH residents. The 2013 ESC guidelines suggest that the elderly population is undertreated and underrepresented in clinical trials. It could be caused by many factors, including multimorbidity, difficult diagnosis because of atypical symptoms and problems in performing stress testing, and a high risk of complications after revascularization procedures.[36] That is why little is known about the management of CHD among nursing home residents.

Our study had some limitations. The study sample is not representative because residents with significant dementia who were unable to give informed consent were excluded from the study because of the protocol implemented. This is definitely the weak point of our study, because according to Welsh et al dementia can be observed in 39% of nursing home residents. Another problem could be the access

Table 3
General Characteristics of Residents With HF

Variable	LTCH (n = 53)	NH (n = 22)
Age, years	80.8 ± 8.1	78.0 ± 7.7
MNA, score	10.4 ± 2.9	11.2 ± 3.2
AMTS, score	6.4 ± 3.2	7.6 ± 1.7
ADL, score	1.6 ± 2.1	4.4 ± 2.2*
Barthel Index, score	22.6 ± 17.4	69.5 ± 35.5*
Systolic BP, mmHg	121.7 ± 12.6	137.9 ± 17.9*
Diastolic BP, mmHg	69.9 ± 10.5	73.5 ± 10.9
Number of drugs	7.3 ± 3.4	8.6 ± 3.4
Number of chronic diseases	4.7 ± 1.8	5.6 ± 1.9†

ADL, Activities of Daily Living score.
Data are presented as means ± standard deviations or numbers (percentages).
*$P < .001$.
†$P < .05$.

Table 4
General Characteristics of Residents With CHD

Variable	LTCH (n = 60)	NH (n = 54)
Age, years	81.2 ± 8.2	78.1 ± 9.0*
MNA, score	10.2 ± 2.9	10.7 ± 3.2
AMTS, score	6.5 ± 3.3	6.5 ± 2.8
ADL, score	1.6 ± 2.1	4.4 ± 2.1†
Barthel Index, score	22.7 ± 17.5	71.8 ± 34.9†
Systolic BP, mmHg	122.9 ± 12.4	131.9 ± 18.4‡
Diastolic BP, mmHg	69.9 ± 10.1	72.3 ± 9.6
Number of drugs	7.1 ± 3.5	7.0 ± 3.2
Number of chronic diseases	4.8 ± 1.7	4.9 ± 1.7

ADL, Activities of Daily Living score.
Data are presented as means ± standard deviations or numbers (percentages).
*$P < .05$; †$P < .001$; ‡$P < .01$.

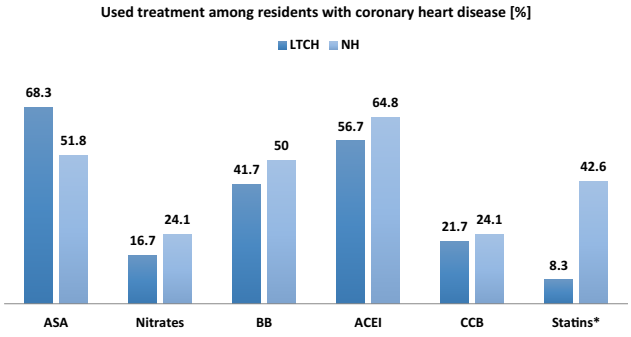

Fig. 5. Treatment used among residents with CHD (%). *$P < .001$. (ASA, aspirin.)

to echocardiography—in most study participants the current measurement of left ventricular ejection fraction had not been performed, which could have made it difficult to estimate the type of HF and assess the choice of treatment used.

Conclusions

In summary, the study showed that insufficient treatment of cardiovascular diseases among elderly residents of LTC facilities could be a potential risk factor of poor prognosis.

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