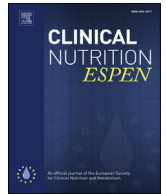




Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: <http://www.clinicalnutritionespen.com>

Original article

## Dietary interventions in cardiac rehabilitation – The gap between guidelines and clinical practice

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### ARTICLE INFO

#### Article history:

Received 14 March 2018

Accepted 15 May 2018

#### Keywords:

Cardiac rehabilitation  
Dietary interventions  
Nutritional interventions  
National clinical guideline  
Ischemic heart disease  
Nationwide survey

### SUMMARY

**Background & aims:** An unhealthy diet is a risk factor for ischemic heart disease (IHD) and therefore cardiac rehabilitation (CR) should include dietary interventions. In 2007, CR became a shared responsibility between Danish hospitals and municipalities. Later, a national clinical guideline including recommendations on dietary interventions was developed to facilitate implementation of CR. The aim of the present study is: 1) To describe provision of dietary interventions in CR for IHD patients in Denmark in 2013 and 2015 emphasizing differences between hospitals and municipalities, and 2) To evaluate the implementation of the national clinical guideline in clinical practice.

**Methods:** A repeated nationwide cross-sectional electronic survey was carried out in 2013 and 2015. Participation was mandatory for all Danish hospital departments offering CR ( $n = 36$ ), but voluntary for municipalities ( $n = 98$ ) reaching response rates of 82% and 89% in 2013 and 2015, respectively. The electronic survey covered the core components of dietary interventions in CR as described in the national clinical guideline.

**Results:** In 2015, 72% of municipalities provided dietary interventions. This proportion was significantly higher in hospitals (94%,  $p = 0.007$ ). 26% and 38% of hospitals screened systematically for dietary intervention needs in 2013 and 2015, respectively. Corresponding results from municipalities were 26% and 29%. No significant differences were seen in clinical practice over time.

**Conclusions:** The results of this study identified a major gap between recommendations in the national clinical guideline and actual clinical practice on dietary interventions in CR in Danish hospitals and municipalities. The study confirmed that implementation of guidelines in clinical practice takes time and requires an intensive effort.

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**Abbreviations:** IHD, Ischemic heart disease; CR, Cardiac rehabilitation.

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<https://doi.org/10.1016/j.clnesp.2018.05.007>

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Please cite this article in press as: Kristensen MB, et al., Dietary interventions in cardiac rehabilitation – The gap between guidelines and clinical practice, Clinical Nutrition ESPEN (2018), <https://doi.org/10.1016/j.clnesp.2018.05.007>

## 1. Introduction

Ischemic heart disease (IHD) is the leading cause of death worldwide accounting for 15% of deaths in 2015 [1]. As a major contributor to mortality and morbidity [2,3], IHD causes decreased physical function, impaired quality of life and constitutes a significant economic burden to the western health systems [4,5].

Some of the risk of IHD is related to diet [6–10]. It is estimated that the IHD mortality in Denmark may be further reduced if the population follows the public dietary recommendations [11]. This means an increased intake of fruits and vegetables, nuts, whole grain, oily fish and a reduced intake of salt and saturated fat [12–14]. These public recommendations also apply to IHD patients [13,15,16]. A Swedish cohort study (n = 17,126) found that high adherence to the Swedish public dietary recommendations, similar to the Danish [14], was associated with 32% and 27% relative risk reduction for cardiovascular events in men and women respectively [17]. While the rehabilitation phase might be a window of opportunity for motivating the IHD patient to make dietary changes towards a healthier diet, an American study with 555 participants showed that patients with IHD maintain their habitual diet unless they receive dietary interventions [18]. Furthermore, changes in dietary habits and compliance to dietary guidelines may depend on the duration and quality of the provided dietary interventions. A small Danish randomized controlled trial (n = 36) showed that two tailored sessions of 50 min with a clinical dietitian reduced fat intake by 15% and saturated fat by 25% compared to brief dietary advice that showed no changes in dietary habits [19].

In an Italian randomized controlled trial (n = 160), all patients attended two 1-h nutritional education meetings, one led by a dietitian and one led by an endocrinologist, and a multidisciplinary educational meeting on risk factors for cardiovascular disease. In addition to this, the intervention group received a personalized nutritional counselling session with a clinical dietitian after 6 months. While body weight and intake of energy, alcohol, fat and carbohydrates were reduced in the intervention group after 12 months, no changes were seen in the control group [20]. Other studies [21–29] have shown that dietary interventions in cardiac rehabilitation (CR) result in improvements in self-reported dietary habits with increased intake of fish [21,28], vegetables [22,24,28] and fibres [21,22], reduced intake of total fat [24,28] and saturated fat [22,24,27] and improved overall diet assessed by various diet index scores [23,25,26,28]. Hence, dietary interventions should be a component of CR.

The World Health Organization encourages community based outpatient health services, as the proximity to the patient may improve adherence among vulnerable patients and decrease the risk of social inequality in health [30,31]. Until 2007, outpatient CR in Denmark was offered only at a regional level (responsible for hospital management). Due to a political structural reform in 2007, outpatient CR became a shared responsibility between the hospitals and the municipalities (responsible for the community level rehabilitation services) [32]. A common concern was the risk of the hospitals minimizing their CR without the municipalities being ready to take over [33]. A survey mapping in 2011 showed that only 54% of the Danish municipalities provided CR [34]. To facilitate implementation of CR and to improve the quality of CR in Danish hospitals and municipalities, a national clinical guideline including core components such as diet and physical activity was developed in 2013 on the initiative of The Danish Health Authority [13]. However, clinical guidelines have little effect unless implemented in clinical practice and this can be challenging [35,36]. Hence, guidelines' impact on the quality of health services should always be monitored [37]. Based on a unique national dataset [38], the aim of the present study was two-fold: 1) to describe the currently

provided dietary interventions in CR for IHD patients in Denmark on a structural level, with emphasis on the differences between hospitals and municipalities and on the development in clinical practice from 2013 to 2015, and 2) to evaluate whether clinicians have implemented the national clinical guideline within the area of clinical nutrition.

## 2. Materials and methods

The study is based on data from a repeated nationwide cross-sectional electronic survey carried out in 2013 and 2015. All Danish hospital departments offering CR (n = 36) and all Danish municipalities (n = 98) were invited to participate [39].

Data regarding dietary interventions in the hospitals' CR were derived from the Danish Cardiac Rehabilitation Database, which routinely collects data on CR programs in Denmark using electronic questionnaires [38]. National data on CR at municipality level are not routinely collected but a separate, parallel electronic survey covering all the Danish municipalities was undertaken in 2013 with follow-up in 2015 [39].

The electronic questionnaires sent to the hospitals were based on a previously tested and applied version [40] and were modified to cover core components of the recommendations in the national clinical guideline. The questionnaires consisted of four separate questionnaires covering the different profession areas in the multidisciplinary CR team: physician, nurse, clinical dietitian and physiotherapist [39]. The present study only includes data from the clinical dietitian questionnaire. The clinical dietitian questionnaire covered the national clinical guideline recommendations on the organization and mode of delivery of dietary interventions in CR, Table 1. The national clinical guideline recommends that patients with IHD undergo initial assessment regarding the need for dietary interventions, and that patients with identified needs are offered dietary treatment [13]. It suggests that the systematic evaluation of dietary habits and the screening for dietary intervention needs is performed with HeartDiet, a Danish food frequency questionnaire validated in patients with IHD [41]. The dietary treatment can be offered as individual consultations or group sessions and may be supplemented with practical training e.g. cooking classes. The national clinical guideline does not specify which health professionals should carry out the interventions [13], however the only health professionals in the Danish health system authorized to perform dietary treatment are clinical dietitians. For this reason, a question on which health professionals are involved in the dietary interventions is included in the questionnaire. According to the national clinical guideline, it is good practice to consider the participants motivation and barriers to participation and adherence to

**Table 1**

Core components of the electronic questionnaire on dietary interventions in cardiac rehabilitation sent to Danish hospitals and municipalities in 2013 and 2015.

Core component
Dietary interventions are a component of cardiac rehabilitation
Clinical dietitians are a part of cardiac rehabilitation teams
Systematic screening for dietary intervention needs
- Systematic screening with HeartDiet
- Systematic screening with Diet History Interview
- Systematic screening with Food Records
- Systematic screening with other tools
Mode of delivery of the provided dietary interventions in cardiac rehabilitation
- Individual counselling by clinical dietitian
- Group sessions by clinical dietitian
- Group sessions by other health professional
- Practical training by clinical dietitian
- Practical training by other health professional
Socially differentiated dietary interventions in cardiac rehabilitation

CR. A suggested strategy is socially differentiated CR [13]. Hence, questions on socially differentiation in dietary interventions in CR are also included in the survey from 2015. For the municipalities, a slightly modified version of the Danish Cardiac Rehabilitation Database survey was applied to allow for comparisons between hospitals and municipalities. In the survey questions, the word 'hospital' was replaced by 'municipality' and a few response options were modified to fit the municipality context. Content validity of the municipality questionnaire was pilot-tested before use [39]. Relevant respondents at the hospitals were identified by telephone contact to each hospital department while relevant respondents in each municipality were identified through the Danish national website sundhed.dk [39].

The electronic surveys were conducted using Analyzer Survey Solutions ([www.analyzer.com](http://www.analyzer.com)) [39].

An invitation to fill out the web-based questionnaire was sent by e-mail to the respondents identified at the hospitals and municipalities. Two e-mail reminders were sent. Remaining non-responders after two reminders were contacted by telephone. The cover letter to the hospital healthcare professionals included a sentence about mandatory responses since the questionnaire emanated from the Danish Cardiac Rehabilitation Database, in which registering data from hospitals is required according to Danish law [38]. Participation for the municipalities was voluntary [39].

### 2.1. Data analysis and statistical considerations

Descriptive statistics were used and for all categorical variables frequencies are presented in percentages and proportions for municipalities and hospitals respectively. Differences between municipalities and hospitals and differences within groups from 2013 to 2015 on categorical variables were tested using Fisher's Exact Test. Hospitals and municipalities who reported not to offer dietary interventions as a component of CR were not included in the data analyses. Since missing data only occurred in some of the open-ended questions this was not adjusted for in the analyses. The question regarding tools used for systematic evaluation of dietary habits and screening for dietary intervention needs, was an open-ended question with the possibility for multiple answers. For analysis and presentation, these data were divided into five categories: the three most frequently reported tools and methods (HeartDiet [41], Diet History Interview [42], Food Records [42]), 'Other' (all other tools mentioned) and 'Not answered'. A significance level of 0.05 was applied and STATA/IC 15.0 was used for the statistical analyses.

### 2.2. Ethical statement

Approval from The Scientific Ethical Committee was not necessary in this study according to Danish law, since it does not include patient data or biological material. The study was registered by the Danish Data Protection Agency, Region Zealand, regional approval number REG-149-2015. Use of the survey data was approved by the steering committee for the Danish Cardiac Rehabilitation Database (nr. DHRD-2017-05-24). The names of the survey respondents, hospitals and municipalities were kept confidential.

## 3. Results

### 3.1. Response rate and participants

All invited hospitals (100%) responded to the questionnaire in 2013 and 2015 while 82% and 89% of the municipalities responded to the questionnaire in 2013 and 2015 respectively, Fig. 1. No significant differences were seen in regional affiliation among responding and non-responding municipalities.

### 3.2. Dietary interventions as a component of cardiac rehabilitation

In 2015, 72% of the municipalities offered dietary interventions whereas the corresponding result for the hospitals was 94%. No significant differences were found between the results from 2013 to 2015 for hospitals and municipalities, respectively. However, the proportion of municipalities reporting to offer dietary interventions were significantly smaller than the proportion of hospitals in both 2013 and 2015 (2013:  $p = 0.048$ ; 2015:  $p = 0.007$ ), Fig. 1.

The proportion of municipalities offering dietary interventions as a component of CR, Fig. 2, differed significantly among the five healthcare regions of Denmark in 2015 ( $p = 0.001$ ), but not in 2013 ( $p = 0.136$ ).

### 3.3. Clinical dietitians as a part of cardiac rehabilitation teams

In 2013, all hospitals (100%) and 94% of the municipalities reported that clinical dietitians were a part of their multidisciplinary CR team, while these numbers were 100% and 89% in 2015. The difference between hospitals and municipalities was not significant, Table 2.

### 3.4. Systematic screening for dietary intervention needs

Among included hospitals, 26% and 38% were performing systematic screening for dietary intervention needs in 2013 and 2015, respectively. This did not differ significantly compared to the included municipalities, where the corresponding results were 26% and 29%, Table 2. No significant differences were seen between results from 2013 to 2015 within municipalities or hospitals. In the hospitals, Diet History Interview and Food Records were the two most frequently used tools in 2013 (17%) whereas HeartDiet was most frequently used in 2015 (24%). In the municipalities, HeartDiet was the most frequently used tool in 2013 (8%), while 'Other tools' were reported in 14% of the municipalities in 2015, Table 2.

### 3.5. Mode of delivery of the offered dietary intervention

In 2013, individual counselling by clinical dietitian was the most frequently reported (94%) mode of delivery of the dietary interventions in hospitals followed by group sessions by clinical dietitian (83%), Table 2. Results from 2015 were similar, 94% and 85% respectively, and no significant difference were seen in the two-year follow-up period. In municipalities, group sessions by clinical dietitian were the most frequently reported (70%) mode of delivery of the dietary interventions in 2013 followed by individual counselling by clinical dietitian (62%). In 2015, this had changed, making individual counselling by clinical dietitian the most frequently reported mode of delivery (71%) followed by group sessions by clinical dietitian (67%). Provision of individual counselling by clinical dietitian was significantly more frequent in hospitals in both 2013 ( $p = 0.001$ ) and 2015 ( $p = 0.008$ ) whereas provision of group sessions by other health professionals was significantly more frequent in municipalities ( $p = 0.002$  and  $p = 0.047$  respectively).

### 3.6. Socially differentiated dietary interventions

Socially differentiated dietary interventions in CR were offered by 41% of the hospitals and 43% of the municipalities in 2015 with no significant difference between groups, Table 2.

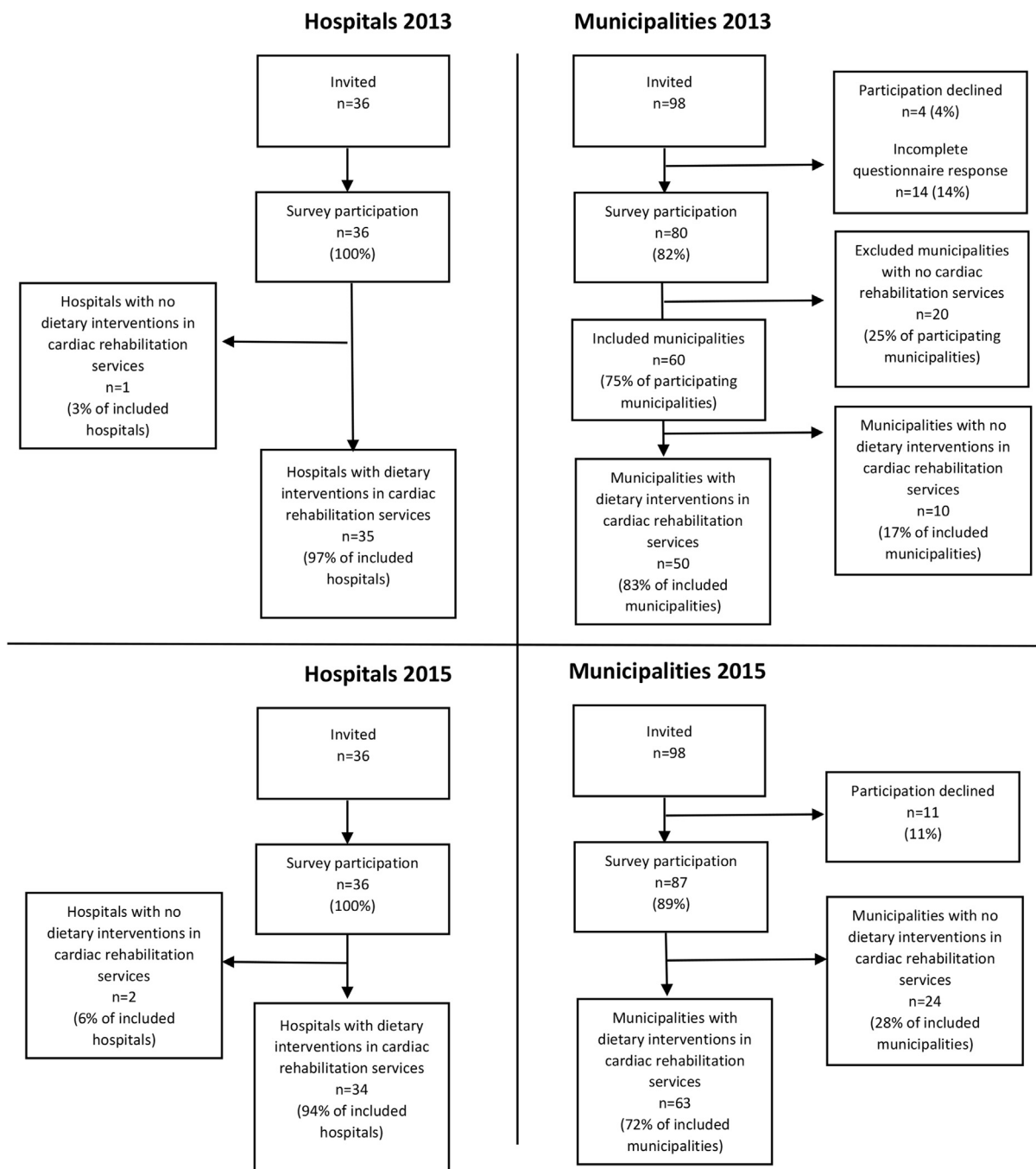


Fig. 1. Flowchart of participation in the survey on dietary interventions in cardiac rehabilitation among Danish hospitals and municipalities in 2013 and 2015.

#### 4. Discussion

This study on provision of dietary interventions in CR in hospitals and municipalities in Denmark identified a major gap between the national clinical guideline [13] and clinical practice.

Since dietary interventions as a component of CR are not offered in all hospital and municipalities and since systematic screening for dietary intervention needs is performed in less than half of the hospitals and only in one third of municipalities, we consider it fair to conclude that there is much room for quality improvement. None of these results had improved significantly since 2013. Like many other European countries, Denmark has had clinical guidelines for CR since the 1990's, and ever since the first guideline, dietary interventions have been a part of the recommendations [40,43–45].

In 1999, a nationwide survey among all Danish hospitals showed that 89% of the hospitals offered dietary interventions as a part of their outpatient CR [40]. In 2013, this had increased to 97%. In 2015, Egholm et al. [39] and our study showed that 94% of hospitals offered dietary interventions, and that this had not changed significantly since 2013 [39]. This indicates that a national clinical guideline did not improve clinical practice in dietary interventions in CR within two years of publication.

The results of the present study may be compared to results from other countries. A national survey of CR provided in New Zealand in 2015 showed that dietary advice was provided in outpatient CR at all the responding CR units (both hospitals and municipalities), either in house (91%) or delivered by an external provider (9%). Weight management was offered in 91% of the CR

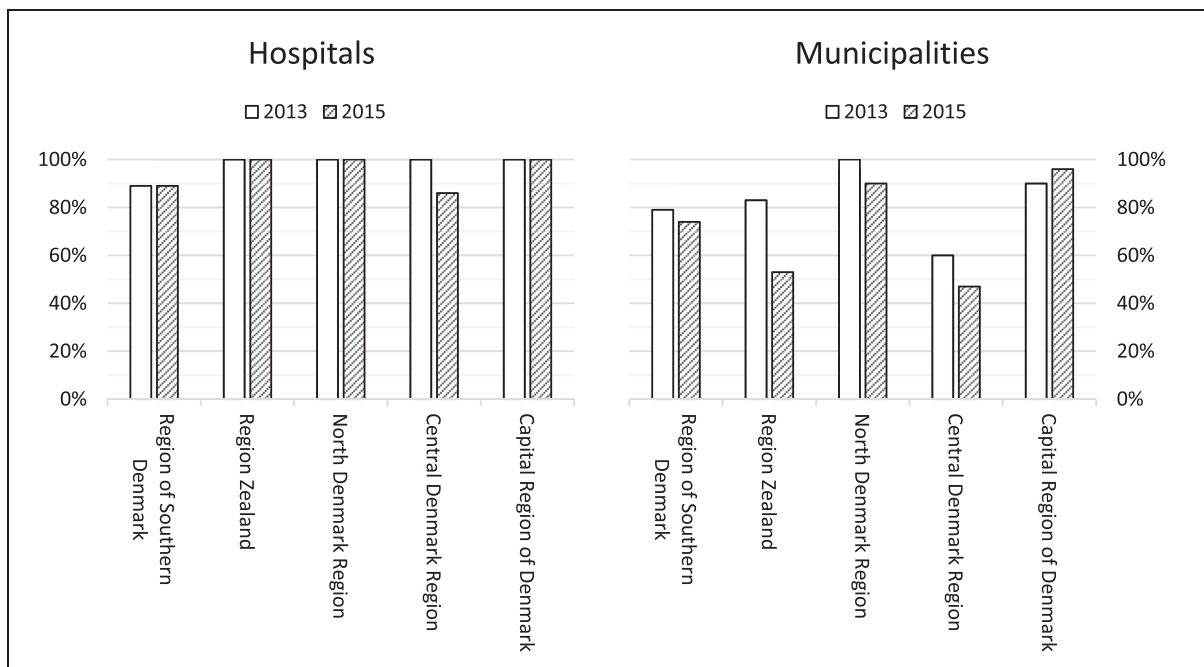


Fig. 2. Percentage of Danish hospitals and municipalities offering dietary interventions in cardiac rehabilitation in the five Danish regions in 2013 and 2015.

Table 2

Provision of dietary interventions and systematic screening for dietary intervention needs in cardiac rehabilitation in Danish hospitals and municipalities in 2013 and 2015.

	Hospitals			Municipalities			Difference between hospitals and municipalities (p-value <sup>b</sup> )	
	2013	2015	p-value <sup>a</sup>	2013	2015	p-value <sup>a</sup>	2013	2015
<b>Dietary interventions are a component of cardiac rehabilitation<sup>c</sup></b>	97% (35/36)	94% (34/36)	1.000	83% (50/60)	72% (63/87)	0.164	0.048*	0.007*
<b>Clinical dietitians are a part of cardiac rehabilitation teams</b>	100% (35/35)	100% (34/34)	–	94% (47/50)	89% (56/63)	0.508	0.265	0.092
<b>Systematic screening for dietary intervention needs is performed</b>	26% (9/35)	38% (13/34)	0.309	26% (13/50)	29% (18/63)	0.834	1.000	0.367
- Systematic screening is performed with HeartDiet <sup>d,e</sup>	9% (3/35)	24% (8/34)	0.110	8% (4/50)	8% (5/63)	1.000	1.000	0.057
- Systematic screening is performed with Diet history interview <sup>e</sup>	17% (6/35)	21% (7/34)	0.766	4% (8/50)	3% (2/63)	1.000	0.060	0.008*
- Systematic screening is performed with Food records <sup>e</sup>	17% (6/35)	3% (1/34)	0.106	2% (1/50)	5% (3/63)	0.628	0.018*	1.000
- Systematic screening is performed with other tools <sup>e</sup>	0% (0/35)	3% (1/34)	0.493	6% (3/50)	14% (9/63)	0.222	0.265	0.157
<b>Mode of delivery of dietary interventions in cardiac rehabilitation</b>								
- Individual counselling by clinical dietitian <sup>e</sup>	94% (33/35)	94% (32/34)	1.000	62% (31/50)	71% (45/63)	0.318	0.001*	0.008*
- Group sessions by clinical dietitian <sup>e</sup>	83% (29/35)	85% (29/34)	1.000	70% (35/50)	67% (42/63)	0.839	0.209	0.057
- Group sessions by other health professional <sup>e</sup>	0% (0/35)	0% (0/34)	–	22% (11/50)	13% (8/63)	0.213	0.002*	0.047*
- Practical training by clinical dietitian <sup>e</sup>	20% (7/35)	24% (8/34)	0.777	28% (19/50)	26% (16/63)	0.159	0.096	1.000
- Practical training by other health professional <sup>e</sup>	0% (0/35)	0% (0/34)	–	14% (7/50)	10% (6/63)	0.557	0.038*	0.088
<b>Socially differentiated dietary interventions in cardiac rehabilitation</b>		41% (14/34)			43% (27/63)			1.000

\*p < 0.05.

<sup>a</sup> Differences between results from 2013 and 2015 within groups were tested using Fisher's Exact test.

<sup>b</sup> Differences between groups in 2013 and 2015 respectively were tested using Fisher's Exact test.

<sup>c</sup> In the analyses on the proportion of hospitals and municipalities with dietary interventions as a part of cardiac rehabilitation services, all respondents with cardiac rehabilitation services were included. Other analyses were restricted to hospitals and municipalities with dietary interventions in cardiac rehabilitation services.

<sup>d</sup> HeartDiet is a Danish food frequency questionnaire, validated in patients with IHD [1].

<sup>e</sup> Each respondent could give more than one answer.

units as in house service (56%) or offered by an external provider (44%) [46]. The annual report of the British Heart Foundation's national audit on CR in UK hospitals and municipalities in 2015 did not provide data on the provision of dietary interventions in CR. However, the audit showed that dietitians are a part of the CR team in 55%, 80% and 65%, in England, Northern Ireland and Wales, respectively [47]. In the report for the following year, 2016, the authors highlighted that these numbers have decreased by 5% - a dip in an otherwise up going trend of including dietitians in the multidisciplinary CR teams [48].

We saw a significant difference between the proportion of municipalities and the proportion of hospitals offering dietary interventions in both 2013 and 2015. Furthermore, there were significant differences between the proportion of municipalities offering dietary interventions in the five Danish regions with 47% as the lowest proportion and 100% as the highest. In worst case, this could translate into unequal access to dietary interventions for patients in different municipalities and regions. Another interesting finding of our study is that in 2013, 25% of the responding municipalities reported not to offer any outpatient CR. In 2015, all responding municipalities offered outpatient CR, indicating a positive development in the provision of CR at the community level. However, as the proportion of municipalities offering dietary interventions did not increase from 2013 to 2015, in fact a non-significant decrease from 83% to 72% was seen, it might indicate that dietary interventions are not highly prioritized, when a municipality establishes CR. This again points to the fact that the national clinical guideline might not be consulted when developing CR services.

In the Danish health system, clinical dietitians are the only health professionals trained and authorized to perform individual dietary treatment for patients with the need for dietary interventions [49,50].

In 2015, 94% of Danish hospitals reported to have clinical dietitians as a part of their CR but a significantly smaller proportion of the municipalities, 64%, reported the same. While other health professionals may be trained to give general dietary advice, municipalities without clinical dietitians do not have the option to offer individual dietary treatment if needed. As described in the introduction, personalized dietary advice may lead to a better adherence in IHD patients [19,20]. Hence, not having a clinical dietitian as a part of the CR team may negatively affect the quality of the offered dietary interventions and the health behavior of the IHD patient.

Social inequality in cardiac health has been documented with the risk of myocardial infarction being associated with social class, educational level and occupational status [52]. Furthermore, participation in CR tends to be lower in low educated and socially vulnerable patients. Hence, socially differentiated CR may be a method to improve participation and adherence and to minimize this social inequality [52]. Our study documents equally low access to socially differentiated dietary intervention in hospitals and municipalities (41% and 43% respectively), indicating vast room for improvement also in this aspect of CR services.

The implementation process should be considered in all stages of the development of a clinical guideline [37], and an easy understandable and interpretable guideline may facilitate the implementation [51]. Our study showed no significant changes in clinical practice from 2013 to 2015 regarding the mode of delivery of the dietary interventions offered in CR. This may be due to the fact, that the national clinical guideline does not contain specific recommendations on this topic. The guidelines states, that dietary intervention may be offered as individual consultations or group sessions and may be supplemented with practical training e.g. cooking classes [13]. No specific recommendations are given on when, or to which IHD patients, the different interventions should be offered. However, the guideline specifically recommends that

HeartDiet [41] is used for the screening for dietary intervention needs. This was the case for 9% of the hospitals in 2013, a number that had increased non-significantly to 24% in 2015. This could indicate, that this specific recommendation was easier to implement in the hospitals even though no difference in the use of the screening tool was seen in municipalities.

#### 4.1. Strengths and limitations

A major strength of the present study is that it is a nationwide survey with a high response rate, thus the risk of selection bias can be considered low. Furthermore, the participating and non-participating municipalities did not differ with regards to regional affiliation.

All data are self-reported by hospitals and municipalities. Even though the content validity of the questionnaires was pilot tested and a good inter-rater correlation among respondents from the same institution was shown, we cannot be sure that responses reflect the actual provision of services. A risk of information bias must be assumed as respondents may have reported a clinical practice closer to the recommendations than is actually the case.

The present study documented the provision of services in CR. However, the mere existence of a service does not mean that it is being utilized. From our data, it is not possible to estimate the proportion of IHD patients receiving dietary interventions in CR. Since 2015, it has been mandatory for all Danish hospitals delivering CR to report patient level data to The Danish Cardiac Rehabilitation Database. In the future, this will give us a unique possibility to evaluate and monitor the quality of CR using a combination of process indicators on patient level and structural data on the organization of CR at program level [38].

## 5. Conclusion

The present study identified a major gap between clinical guidelines and clinical practice in dietary intervention in CR in Danish hospitals and municipalities. Differences between the offered dietary interventions between hospitals and municipalities and between the five Danish regions may lead to inequality in health access. This study confirmed that implementation of a national clinical guideline in clinical practice requires an intensive effort and it takes time to facilitate the implementation. Furthermore, recommendations should be specific to ensure straightforward implementation in clinical practice within the area of clinical nutrition.

#### Statement of authorship

Marianne Boll Kristensen, Henriette Knold Rossau, Cecilie Lindström Egholm and Ann-Dorthe Zwisler conducted the survey and analyzed the data. Marianne Boll Kristensen and Karin B. Dieperink interpreted the results and drafted the manuscript with contribution to content from all authors. The final version of the manuscript was approved by all authors.

#### Conflict of interest statement and funding sources

The authors have nothing to declare. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

#### Acknowledgements

We wish to thank the Danish Cardiac Rehabilitation Database for access to this unique dataset. Furthermore, we wish to thank all participating hospitals and municipalities for their participation and their contribution to the study.

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