Survivorship care for cancer patients in primary versus secondary care: a systematic review

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Received: 20 May 2020 / Accepted: 22 June 2020 / Published online: 19 August 2020
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Abstract
Background Cancer survivorship care is traditionally performed in secondary care. Primary care is often involved in cancer management and could therefore play a more prominent role.

Purpose To assess outcomes of cancer survivorship care in primary versus secondary care.

Methods A systematic search of MEDLINE and EMBASE was performed. All original studies on cancer survivorship care in primary versus secondary care were included. A narrative synthesis was used for three distinctive outcomes: (1) clinical, (2) patient-reported, and (3) costs.

Results Sixteen studies were included: 7 randomized trials and 9 observational studies. Meta-analyses were not feasible due to heterogeneity. Most studies reported on solid tumors, like breast (N = 7) and colorectal cancers (N = 3). Clinical outcomes were reported by 10 studies, patient-reported by 11, and costs by 4. No important differences were found on clinical and patient-reported outcomes when comparing primary- with secondary-based care. Some differences were seen relating to the content and quality of survivorship care, such as guideline adherence and follow-up tests, but there was no favorite strategy. Survivorship care in primary care was associated with lower societal costs.

Conclusions Overall, cancer survivorship care in primary care had similar effects on clinical and patient-reported outcomes compared with secondary care, while resulting in lower costs.

Implications for cancer survivors Survivorship care in primary care seems feasible. However, since the design and outcomes of studies differed, conclusive evidence for the equivalence of survivorship care in primary care is still lacking. Ongoing studies will help provide better insights.

Keywords Cancer survivorship care · Primary care · Secondary care · Systematic review

Background

To date, the number of patients with incident cancer and cancer survivors is increasing, due to an aging population and the improvements in cancer screening, diagnosis, and treatment. Cancer survival has increased to over 60% between 2010 and 2020, as previously predicted by The Dutch Cancer Society [1]. In numerous countries worldwide, including the Netherlands, patients treated for cancer are initially included in a secondary care–based follow-up program, mainly focusing on the early detection of recurrences and treatment of symptoms caused by the cancer or its treatment. However, survivorship care for cancer encompasses not only detection of recurrences but also the attention to rehabilitation (psychological and social support, integration in society and secondary prevention) as addressed by the Institute of Medicine (IOM) back in 2006 [2].

Following completion of cancer treatment, many patients experience unmet needs and symptoms [3] and primary care is often involved in management of these needs and symptoms, especially for the older population with comorbidities [4–9]. A more general approach is therefore likely to be favorable to patient outcomes [10]. Traditional core values of primary care, such as the continuity and coordination of care, can lend themselves for the improvement of cancer survivorship, but the role of primary care may vary depending on context and setting [10, 11].

Several reviews have been published on alternative survivorship care strategies, such as GP-, PCP-, nurse-led, patient-
initiated, and shared care [12–16]. However, none have focused exclusively on survivorship care by physicians working in primary care. The aim of this systematic review is to provide an overview of the outcomes of survivorship care in primary- compared with secondary-based care.

**Methods**

**Study design and search strategy**

In February 2020, a systematic search was performed in MEDLINE and EMBASE to identify original studies on cancer survivorship care. General terms for survivorship care, including follow-up and aftercare, were used. In addition to the MEDLINE and EMBASE search, reference checking was performed to identify possible other relevant publications. (See Appendix 1 for the search strategy.)

**Eligibility, selection, and data extraction**

Original studies comparing cancer survivorship care in primary to secondary-based care were included. As health care systems differ around the globe, generalist professions providing primary- or community-based care, such as a general practitioner (GP), primary care physicians (PCPs), and family physicians (FPs), were included in this review. Studies reporting on patients of any age who were (curatively) treated for any type or stage of cancer were eligible. No restrictions were made on the type of outcomes. Economic evaluations of cancer survivorship care programs were also considered for inclusion. Studies on shared care and patient or physician preferences for survivorship care were excluded from this review.

All studies were screened on title and abstract by two independent researchers (JV and TW). Subsequently, complete texts were read to ensure inclusion criteria, and data were extracted. Data extraction was performed by one researcher (JV) based on a predefined data format. Disagreement between the two researchers on study selection and data extraction was resolved by discussion or, if necessary, by consulting a third independent researcher (KvA).

**Data analysis**

As we intended a broad and conclusive review, no restrictions were made on the type of patient, outcomes, or methodology, which resulted in substantial heterogeneity of studies. Therefore, meta-analyses were not feasible and a narrative synthesis was used.

Outcomes were grouped into three distinctive categories: (1) clinical outcomes as measured by medical records (including survival, serious clinical events, and documented follow-up care), (2) patient-reported outcomes as measured by patient questionnaires and interviews (including quality of life, symptoms, patient satisfaction, and self-reported receipt of survivorship care), and (3) costs of survivorship care programs (including societal and patient costs).

**Quality assessment**

A risk of bias analysis was performed for all included studies according to the designated quality assessment tools as advised by the Cochrane collaboration. The consort instrument was used for randomized clinical trials [17], and the ROBINS-I for (non-randomized) observational studies [18].

**Results**

**Study selection**

The systematic search retrieved 1766 original studies (Fig. 1). Reference checking did not identify any additional studies. After title and abstract screening, full text of 42 studies was reviewed. Based on the predefined eligibility criteria, 16 studies were included in this review. Figure 1 illustrates the selection process.

**Quality assessment**

Risk of bias assessment revealed low risk of bias in 10 studies, intermediate in 3, and high risk of bias in 3 out of 16 studies (see Appendix Table 5). Risk of bias was often inherent to the design of the study, including selection, misclassification, recall, and interviewer bias.

**Baseline characteristics**

Table 1 shows the baseline characteristics of the included studies. Seven randomized controlled trials (RCTs) were included in this review [19–25]. Three studies of Grunfeld et al. were based on the same RCT, but reported on separate outcomes [20–22]. Other included studies were based on a type of observational study [26–34]. Most studies reported on patients with solid tumors, such as breast and colorectal cancers. The number of patients ranged from 98 in a retrospective cohort study [26] to 5009 in a quasi-experimental observational study [29]. Six studies reported on physicians working in primary care, of which two studies did not further specify the provider type [31, 32]. The length of follow-up ranged from 1 to 15 years.

**Clinical outcomes**

Ten studies reported on clinical outcomes (see Table 2). No important differences were seen in survival between follow-
up strategies after 3 up to 15 years of follow-up [30, 33, 34]. Follow-up in secondary care was associated with shorter relapse-free survival (RFS) and higher likelihood of receiving palliative treatment with chemotherapy (58% versus 34%, \( p = 0.03 \)) in pancreatic cancer patients in a cohort study, in part because patients in secondary care had more advanced primary tumors [33]. Eight studies examined the occurrence of serious clinical events. No differences were seen relating to the number (and time of diagnosis) of recurrences and metastases [19, 20, 23–26], deaths [23, 25, 29], or other clinical events [23, 24, 26] between primary and secondary care–based follow-up.

Documented follow-up care, as measured by adherence to medical guidelines and follow-up tests, was assessed by two RCT’s. Murchie et al. [24] found that 98.1% of patients in primary-based care were seen according to guidelines versus 80.9% of patients in secondary-based care (\( p = 0.020 \)). In the second study, patients in primary care were more likely to have one or more fecal blood tests (rate ratio 2.4, CI 1.4–4.44, \( p = 0.003 \)), whereas patients in secondary care were more likely to have ultrasounds and colonoscopies, although it remained unclear whether or not this was done in accordance with follow-up guidelines [25].

**Patient-reported outcomes**

Eleven studies, including all six RCTs, measured patient-reported outcomes (see Table 3). After adjustment for clinical and pathological covariates, no differences were seen in overall quality of life (QoL) and anxiety and depression between survivorship care strategies [19, 20, 23–26]. One observational study examined other bothersome symptoms, showing less fatigue among breast cancer patients in primary care (62.0% versus 81.1%, \( p = 0.005 \)) [31].

High levels of patient satisfaction and perception of care were found for survivorship care in both primary- and secondary-based care [22, 24–27, 32]. Using an adapted validated questionnaire, higher levels of patient satisfaction were found in primary care–based groups in two RCTs (9 out of 15 aspects by Grunfeld et al. [22] and 6 out of 15 by Murchie et al. [24]). In contrast, a questionnaire administered in an observational study [26] showed greater satisfaction in all 6 dimensions for breast cancer patients in secondary-based care (\( p < 0.05 \)).

Five observational studies examined self-reported receipt of survivorship care by means of questionnaires and interviews. Disparate results were seen among primary- and secondary-based care, but there was no evidence for a more favorable strategy based on these results. Two studies showed a lower adherence to recommended periodic clinical examinations for breast cancer patients by physicians working in primary care (approximately 80% versus 90% in secondary care, \( p < 0.05 \)) [31, 32]. In another study, patients in primary care were more likely to receive examination as is recommended by national guidelines (58% versus 36%, \( p = 0.004 \)) [27]. No differences were seen in patient self-reported mammogram frequency [28, 31, 32]. Maly et al. [28] found a higher uptake of preventive tests, including Pap smear (AOR 2.90, CI 1.05–8.04, \( p = 0.040 \)) and colonoscopy (AOR 2.99, CI 1.5–8.51, \( p = 0.041 \)), among underserved breast cancer patients in primary care. Physicians in primary care helped more often with lifestyle improvements for colorectal cancer patients [27], but this was not the case among breast cancer patients [31].

**Costs**

Survivorship care in primary care was associated with lower societal and patient costs in all four studies that performed cost
Table 1  Baseline characteristics of the included studies; (a) randomized controlled trials and (b) observational studies

| Author, year, country | Participants | Intervention | Time since diagnosis | Outcome | Baseline differences |
|-----------------------|--------------|-------------|----------------------|---------|----------------------|
| (a) Randomized controlled trials |
| Augestad et al., 2013, Norway[19] | Patients < 75 years curatively treated for colon cancer, Dukes’ stage A, B, or C (N = 110). Transfer of care approximately 3–4 weeks after surgery. | GP- (N = 55) versus surgeon-led survivorship care (N = 55). | 2 years | Clinical, patient-reported and costs | No significant differences. |
| Grunfeld et al., 1996, 1999 and 1999, UK[20–22] | Women curatively treated for early-stage breast cancer I–III (N = 296). Transfer of care after mean 3.4 months (SD 1.8). | GP- (N = 148) versus hospital-based survivorship care (N = 148). | 18 months | Clinical, patient-reported and costs |Patients in the hospital-group were older (59.0 versus 55.6 years) and had more stage I tumors (50.6% versus 40.5%). |
| Grunfeld et al., 2006, UK[23] | Woman curatively treated for early-stage breast cancer I–III (N = 968). Transfer of care between 9 and 15 months after curative treatment. | FP- (N = 483) versus specialist-led survivorship care (N = 485). | 5 years | Clinical and patient-reported | No significant differences. |
| Murchie et al., 2010, UK[24] | Patients curatively treated for primary cutaneous melanoma (N = 142). Transfer of care after median 49 months (IQR 19–76). | GP- (N = 53) versus hospital-based survivorship care (N = 89). | 1 year | Clinical and patient-reported |Patients in the GP-group lived further away to the hospital (27.6 miles (18.9–32.3) versus 10.1 (2.3–25.9)). |
| Wattchow et al., 2006, Australia[25] | Patients curatively treated for colon cancer, Dukes’ stage A, B, or C (N = 203). Transfer of care approximately 4–6 weeks after surgery or chemotherapy. | GP- (N = 97) versus surgeon-led survivorship care (N = 106). | 2 years | Clinical and patient-reported |A trend towards higher levels of education was seen for patients in the surgeon-group (postsecondary school 22.5% versus 8%). |
| (b) Observational studies |
| Baena-Canada et al., 2013, Spain[26] | Woman curatively treated for early stage breast cancer 0–III (N = 98). Transfer of care 5 years after primary treatment. | Primary care- (N = 60) versus hospital-based survivorship care (N = 38). | 10 years | Clinical, patient-reported and costs |Patients in the primary care-group were older (60 versus 38 year, p = 0.002) and received less chemotherapy (62% versus 87%, p = 0.001). |
| Haggstrom et al., 2009, USA[27] | Colorectal cancer survivors (N = 416). Transfer of care unknown. | Comparison of physician specialty most often seen; no physician (N = 113), PCP (N = 50), oncologist (N = 183), surgeon (N = 29) or gastroenterologist (N = 41). | 1 year | Patient-reported |Patients were more inclined to receive care by a specialist if; stage III or IV disease (p = 0.03) and fewer comorbid medical conditions (p = 0.012). |
| Maly et al., 2013, USA[28] | Low-income women aged ≥ 18 years diagnosed with breast cancer stage 0–III (N = 579). Transfer of care unknown. | Comparison of physician specialty most often seen; PCP only (N = 40), specialist only (N = 100) or shared care (N = 439). | 36 months | Patient-reported |No baseline analyses. |
| Mittmann et al., 2018, Canada[29] | Woman curatively treated for any stage of breast cancer (N = 5009). Transfer of care unknown. | PCP- (N = 2685) versus traditional cancer clinic–based survivorship care (N = 2324). | 25 months | Clinical and costs |No differences. |
| Parry et al., 2015, UK[30] | Patients diagnosed with stable stage A0 chronic lymphocytic leukemia (N = 246). Transfer of care unknown (after second outpatient visit). | GP- (N = 105) versus hospital-based survivorship care (N = 141). | Median 66 months (IQR 49–94) in GP-group | Clinical |Patients in the GP-group were older (median age 71 versus 68, p = 0.02) and white cell count at diagnosis was higher (median 13.2 versus 10.4, p = 0.018). |
| Railton et al., 2015, Canada[31] | Women aged ≥ 18 years treated for stage I–III invasive breast cancer (N = 240). Transfer of care from median PCP community- (N = 171) versus cancer center-based survivorship care (N = 69). | From 12 ≥ 48 months | Patient-reported |Patients in PCP-group were older (59.1% ≥ 50 years versus 39.1%, p = 0.005) and had more stage I disease stage |
analyses (see Table 4) [19, 21, 26, 29]. The main cost driver in all studies was the mean cost per visit, including organizational and physician costs.

**Discussion**

In this review, similar effects on clinical and patient-reported outcomes were seen for survivorship care in primary- compared with secondary-based care. Although the evidence should be interpreted with caution, survivorship care in primary care seems feasible and results in lower costs.

**Comparison with existing literature**

A recent Cochrane review found little to no effects on pre-defined outcomes for RCTs comparing non-specialist (e.g., PCP-led, nurse-led, patient-initiated, and shared care) to specialist-led follow-up [12]. The certainty of evidence was generally low due to the limited amount of RCTs. Similarly to the Cochrane review, this review found no important differences in survivorship care between primary and secondary care relating to clinical (survival and recurrences) and patient-reported outcomes (quality of life and symptoms).

This review has identified additional outcomes in comparison with the Cochrane review relating to the content and quality of survivorship care. The content of survivorship care is examined by both documented follow-up care and self-reported receipt of survivorship care. Some differences were seen in these outcomes, especially relating to the adherence to guidelines and follow-up tests, but the results showed no favorite strategy. It remains unclear whether or not these differences may affect other outcomes, such as detection of recurrences and survival. Showing differences in these types of outcomes requires great numbers of patients and considerable follow-up time among often older patients with comorbidities, making this a challenging undertaking.

This review has examined patient’s perceptions and satisfaction with care as indicators for the quality of survivorship care. High levels of quality of care were found for survivorship care in both primary- and secondary-based care. Two out of three RCTs showed higher levels of patient satisfaction with primary-based care, illustrating its feasibility [22, 24]. The aggregation of these results provides us with the indication that survivorship care in primary care is similar to care by a specialist. Moreover, survivorship care in primary care led to lower costs in all studies that performed cost-analyses.

**Strengths and limitations**

Our review provides additional evidence to previous literature by focusing exclusively on survivorship care by physicians.
working in primary care and by including non-randomized studies in the results. By performing a non-restrictive search and selection strategy, two additional outcomes relating to the content and quality of survivorship care have been identified in comparison with the recent Cochrane review. The search strategy, including reference checking, provides a sensitive search result.

There are some limitations that need to be addressed. Inherent to the design of some studies, differences were seen in baseline characteristics. Older patients and patients with prognostic better disease stage were sometimes more likely to receive follow-up in primary care [26, 27, 30–34]. Despite adjusting for covariates, these differences might have influenced outcomes. Due to the substantial heterogeneity in outcomes and methodology, no data could be pooled for meta-analyses, hampering the interpretation of results. However, using a narrative synthesis, no important differences were seen relating to clinical and patient-reported outcomes. These results are in line with previous reviews [12–16].

| Clinical Outcomes | Ref. | Result |
|-------------------|------|--------|
| (a) Survival | | |
| Overall survival (OS) | [30] | 69.5% (GP) versus 68.6% (hospital), p = 0.888. |
| | | In multivariate analyses a HR of 0.81 (PCP), CI 0.49–1.35, p = 0.43. |
| | | Reported as a figure, p = 0.34, non-significance remained in multivariate analyses. |
| Relapse-free survival (RFS) | [30] | 83.0% (GP) versus 78.1% (hospital) remained asymptomatic. 17.0% (GP) versus 21.9% (hospital) needed treatment, p = 0.424. No differences were seen relating to the time to first treatment (p = 0.188). |
| | | Patients in the PCP-group had longer RFS; in multivariate analyses a HR of 0.62 (PCP), CI 0.39–0.98, p = 0.041. Patients in the PCP-group were less likely to receive palliative chemotherapy for their relapse (34% versus 58%, p = 0.03). |
| (b) Serious clinical events | | |
| Recurrences and metastases | [19] | 6 recurrences (GP) versus 8 (hospital), mean time to diagnosis was 35 days (GP) versus 45 days (hospital), p = 0.46. |
| | | 6.8% recurrences (GP) versus 10.8% (hospital), median time to diagnosis 22 days (GP) versus 21 days (hospital), median difference in time to diagnosis 1.5 days (range – 13 to 22). |
| | | 11.2% recurrences (FP) versus 13.2% (specialist), difference 2.02%, CI –2.13–6.16%. |
| | | In both groups 1 diagnosis of recurrent melanoma. |
| | | Recurrence rate of 7.1 per 1000 months (GP) versus 8.0 (surgeon), p = 0.92, median time to detection was 9.5 (GP) versus 8.0 months (surgeon), p = 0.76. |
| | | Reported as a figure, p = 0.59, non-significance remained in multivariate analyses. |
| Deaths | [23] | 6.0% death of any cause (GP) versus 6.2% (specialist), difference 0.18%, CI –2.90–3.26. |
| | | 6.6% death of any cause (PCP) versus 20.3% (specialist), p = 0.7. |
| Other clinical events | [23] | Recurrence-related events (such as hypercalcemia or fracture); 3.5% (FP) versus 3.7% (specialist), difference 0.19%, CI -2.26–2.65%. |
| | | New primary tumors (1 new primary in both groups). |
| | | New primary tumor (5% (primary) versus 10.4% (hospital), p = 0.67), associated diseases (46.7% (primary) versus 60.5% (hospital), p = 0.21) and treatment effects (22.3% (primary) versus 21.1% (hospital), p = 0.79). |
| (c) Documented follow-up care | | |
| Adherence to medical guidelines and follow-up tests | [24] | Patients who visited a GP were more likely to be seen according to guideline (98.1% versus 80.9%, p = 0.020). |
| | | Patients in the GP-group were more likely to visit their physician (1.27 times per quarter versus 0.84 times) and to have one or more FOBTs (rate ratio 2.4, CI 1.4–4.4, p = 0.003). Patients in the surgeon group were more likely to have ultrasounds (rate ratio 0.5, CI 0.3–1.0, p = 0.040) and colonoscopies (rate ratio 0.7, CI 0.5–1.0, p = 0.027). No differences were seen relating to other surveillance tests, including CEA, X-ray and CT-scan. |

GP general practitioner, FP family physician, PCP primary care physician
Table 3  Patient-reported outcomes of cancer survivorship care including (a) quality of life, (b) symptoms, (c) patient satisfaction and perception of care, and (d) self-reported receipt of survivorship care

| Patient-reported                          | Ref. Method                                                                 | Result                                                                                                                                                                                                 |
|-----------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (a) Quality of life (QoL)               | [19] EORTC QLC-30, EuroQol-5D, and EQ VAS at baseline up to 24 months.      | No differences in overall QoL, effects on subscales in favor of GP in role functioning (mean difference −5.1 (CI −9.7 to −0.5), p = 0.02), emotional functioning (−3.7 (CI −6.8 to −0.6), p = 0.01) and pain (4.5 (CI 0.8–8.2), p = 0.01). |
|                                         | [20] SF-36 and EORTC QLC-30 at baseline, mid- and end-of-trial.             | No differences on any subscale.                                                                                                                                                                          |
|                                         | [23] SF-36 at baseline up to 60 months.                                     | No differences on any subscale.                                                                                                                                                                          |
|                                         | [24] SF-36 at baseline and 12 months.                                      | No differences on any subscale.                                                                                                                                                                          |
|                                         | [25] SF-12 PCS and MCS scores at baseline, 12 and 24 months.               | No differences on any subscale.                                                                                                                                                                          |
|                                         | [26] SF-36 (administered once more than 5 years after treatment).           | No differences on any subscale after adjustment for age and chemotherapy.                                                                                                                                 |
| (b) Symptoms                             |                                                                             |                                                                                                                                                                                                     |
| Anxiety and depression                   | [20] HADS at baseline, mid- and end-of-trial.                              | Anxiety scale difference 0.4 (CI −0.3 to 1.2), depression scale difference 0.4 (CI −0.2, to 1.1).                                                                                                                                                      |
|                                         | [23] HADS at baseline up to 60 months.                                     | Reported as a figure; no differences.                                                                                                                                                                |
|                                         | [24] HADS at baseline and 12 months.                                       | 8 patients were diagnosed as anxious (GP) versus 13 (hospital) (p = 0.868), 3 patients as depressed (GP) versus 5 (hospital) (p = 0.912).                                                                 |
|                                         | [25] HADS at baseline, 12- and 24 months.                                 | Median anxiety score 4.0, IQR 5.0 (GP) versus 5.0, IQR 4.5 (surgeon) (p = 0.106), median depression score 4.0, IQR 5.0 (GP versus 3.0, IQR 4.0 (hospital) (p = 0.796). |
| Other bothersome symptoms               | [31] One-time structured telephone interview.                             | Patient who visited a PCP had less fatigue (62.0% versus 81.1%, p = 0.005). No differences for other symptoms (arthralgias, hot flashes, memory loss, vaginal dryness, insomnia, paraesthesias and depression). |
| (c) Patient satisfaction and perception of care | [22] Adapted satisfaction questionnaire at baseline, mid-, and end of trial (Cronbach’s alpha = 0.70). | Patients who visited a GP had greater satisfaction on 9 out of 15 aspects (relating to service delivery, consultation and continuity of care).                                                                         |
|                                         | [24] Patient questionnaire at baseline and 12 months (Cronbach’s Alpha = 0.70). | Patients who visited a GP had greater satisfaction on 6 out of 15 aspects (relating to service delivery, consultation and continuity of care), the mean score was 26.4, CI 24.9–27.9 (GP), versus 33.5, CI 32.5–34.4 (hospital), the change in mean summary score was −5.96, CI −8.09–3.89 (GP), versus 0.29, CI −1.49–2.08 (hospital), indicating higher satisfaction with GP (p < 0.001). |
|                                         | [25] PSVQ at 24 months (previously validated).                            | No differences on any subscale.                                                                                                                                                                          |
|                                         | [26] Questionnaire administered once, more than 5 years after treatment, Cronbach’s Alpha = 0.88. | Patients who visited a specialist had greater satisfaction on all 6 dimensions; health care attention (p = 0.001), attention by medical personnel (p = 0.006) and nursing personnel (p = 0.016), recommendation of service (p = 0.019), information provision (p = 0.003) and respect/friendliness (p = 0.008). |
|                                         | [27] Adapted patient questionnaire on perceptions of follow-up 2–5 years after diagnosis. | No differences in communication, coordination, nursing care, office staff and follow-up rating; non-significance remained in multivariate regression.                                                                 |
|                                         | [32] Computer-aided telephone interview on perception of follow-up.         | Women who visited an oncologist reported a marginally higher degree of care coordination (81.9% versus 73.1%, OR 1.8, CI 1.0–3.5).                                                                                                                                 |
| (d) Self-reported receipt of survivorship care | [27] Patient questionnaire on visits, tests and examinations 2–5 years after diagnosis. | The number of visits in the past year varied by physician specialty (p = 0.001). Patients in the PCP-group were less likely to see a doctor for “follow-up medical tests” (68% versus 89%, p < 0.001) and more likely to receive a physical examination (58% versus 36%, p = 0.004). PCPs more often helped with lifestyle improvements (83% versus 63%, p = 0.015) and discussed diet (70% versus 48%, p = 0.005). |
| Adherence to medical guidelines and follow-up tests | [28] Patient survey on receipt of preventive care at baseline, 6, 18 and 36 months after diagnosis. | Patients who visited a PCP only were more likely to receive a Pap smear (AOR 2.90, CI 1.05–8.04, p = 0.040) and colonoscopy (AOR 2.99, CI 1.5–8.51, p = 0.041). No differences were seen in receipt of mammogram (p = 0.109). |
|                                         | [31] One-time structured telephone interview on receipt of follow-up.       | Patients who visited a PCP had fewer clinical examinations (85.6% versus 95.7%, p = 0.04), no differences were seen in accessing physician for examination, receipt of mammograms, having an endocrine therapy plan, psychosocial and sexual health, lifestyle management or need for assistance with follow-up goals. |
|                                         | [32] Computer-aided telephone interview on receipt of follow-up.           | Patients who visited a PCP were less likely to receive a clinical breast exam (79.6% versus 90.2%, OR 2.5, CI 1.2–5.5). No differences were seen in receipt of mammogram, X-ray scans, physical exam or education about breast self-exam. Women who visited an oncologist reported more tumor marker (OR 3.0, CI 1.5–5.8) and other blood tests (OR 2.0, CI 1.1–3.5). |

GP general practitioner, PCP primary care physician
Table 4 Costs of cancer survivorship care including (a) societal costs and (b) patient costs

| Costs | Ref. | Method | Result |
|-------|------|--------|--------|
| (a) Societal costs | | | |
| [19] | Cost- and utilization questionnaire filled in by patients at baseline up to 24 months (including visits, tests and events such as metastases). | Mean cost of follow-up per patient per follow-up cycle was £292 (GP) versus £351 (surgeon), \( p = 0.02 \). Mean societal cost per patient for 24 months follow-up was £8233, range £7904 to £8619 (GP), versus £9889, range £9569 to £10,194 (surgeon), mean difference in favor of GP £1656, \( p < 0.001 \). |
| [21] | Record-of-visit form filled in by doctors at baseline up to 18 months (including visits and tests). | Mean total cost per patient for 18 months follow-up was £64.7, range £5.8–301.9 (GP) versus £195.1, range £62.0–737.4 (surgeon), mean difference £130.4 (range £−149.1−111.6) in favor of GP, \( p < 0.001 \). Difference mainly due to mean cost of visit (mean cost £40.9, range £5.8–143.8 (GP), versus £174.1, range 62.0–558.0 (surgeon)). |
| [26] | Direct costs based on a single national database (Consejería de Salud, Junta de Andalucía) (including visits and tests). | Total cost of follow-up per patient per year was mean £112.86, SD 77.54 (primary care), versus mean £184.61, SD 85.87 (hospital), \( p = 0.0001 \). Difference mainly due to costs per visit (mean £17.46, SD 8.62 (primary), versus mean £60.32, SD 21.19 (hospital), \( p < 0.001 \). |
| [29] | Direct costs based on multiple national databases (including visits, tests, medication and events such as hospitalization). | Mean annual total cost per survivor was CAD $6575, CI $5563 to $7587 (PCP) versus $10,832, CI $9947 to $11,717 (specialist), resulting in $4257, CI $2928 to $5587, lower annual cost (39.3% reduction) per survivor in the PCP group. A 22.1% reduction in overall median annual costs ($2261 versus $2903) was seen. Main cost drivers included hospitalization, physician visits, medications, and home care. The PCP group had lower mean annual costs for same-day surgery, cancer clinic visits, physician visits, medications, long-term care, and home care. |
| (b) Patient costs | | | |
| [19] | Cost- and utilization questionnaire filled in by patients at baseline up to 24 months (including travel, out-of-pocket expenses and work loss). | More patients had expenses relating to travel in the hospital-group (£156.9 versus £76.7, \( p < 0.001 \). No differences were seen relating to out-of-pocket expenses (\( p = 0.10 \)) or work loss (\( p = 0.45 \)). |
| [21] | Cost-questionnaire filled in by patients at baseline up to 18 months (including travel, out-of-pocket expenses, work loss, child support and spent time for an appointment). | Patients in the GP-group were more frequently in paid employment (47.8% versus 31.0%, \( p = 0.023 \), walked to their appointment (32.4% versus 1.6%, \( p = 0.000 \), spent less time getting to their appointment (13.1 min (SD 8.3) versus 26.7 (SD 15.9)), spent more time during the appointment (52.6 min (SD 22.1) versus 82.2 (SD 31.8)). Patients in the hospital-group took more time off work (61.1% versus 32.3%, \( p = 0.006 \)) and had more out-of-pocket expenses (including parking fare, 11.0% versus 2.4%, \( p = 0.008 \). No differences were seen in the proportion of patients losing wages (\( p = 0.24 \)) or in need of child care (\( p = 0.06 \). |

GP general practitioner, PCP primary care physician

Implications for future practice and research

As the number of cancer survivors is rapidly increasing and resources are limited [12–16], alternative survivorship care strategies for the hospital-based survivorship care are deemed desirable. This review showed that cancer survivorship care in primary care seems feasible and worthwhile to consider. However, the role and capacity of physicians in primary care can vary depending on context and setting [10, 11]. Most studies were performed in the UK and Canada in which physicians work as gatekeepers to secondary health care services. In these countries, a publicly funded universal health care system is in place. Other studies were performed in countries such as the US and Spain in which the health care system is both publicly and privately funded, and the role of primary care could be less distinguished. The randomized trials that could be identified, were limited to countries with a universal health care system, so further research is warranted to evaluate whether the results of these trials are also applicable to other health care systems. Furthermore, both clinical and patient-reported outcomes might change over time and could be affected by the length of follow-up. Therefore, to assess durable effects of survivorship care, greater number of patients and considerable follow-up time in these trials would be preferable. Moreover, the impact on the work-load for primary care physicians needs to be evaluated in case of growing numbers of patients in primary care–based cancer survivorship care.
Conclusion

This review presents a comprehensive overview of survivorship care in primary care. To our opinion, this review has underlined the feasibility of survivorship care in primary care or possibility of some form of cooperative care. However, delivering high-quality survivorship care will also put restraints on primary care. This requires not only sufficient funding but also investments in organization and staff. Further studies with adequate designs are needed.

Author contributions
All authors contributed to the study conception. The literature search was performed by J.A.M. Vos in collaboration with a medical librarian (F. van Etten-Jamaludin) of the Amsterdam UMC. Data selection and analysis were performed by J.A.M. Vos, T. Wieldraaijer and K.M. van Asselt. The first draft of the manuscript was written by J.A.M. Vos. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest
The authors declare that they have no conflict of interest.

Ethical approval
This article does not contain any studies with human participants performed by any of the authors.

Appendix 1. Search strategy

The following search strategy was used in MEDLINE. The search strategy was developed in collaboration with a medical librarian (FvE) of the Amsterdam UMC, location AMC. A total of 1766 studies were found from inception up to the 22nd of February of 2020.

| Search | Add to builder | Query | Items found | Time |
|--------|----------------|-------|-------------|------|
| #1     | Add            | Search "Neoplasms"[Mesh] OR "Cancer Survivors"[Mesh] OR neoplasms*[tiab] OR cancer*[tiab] OR tumor*[tiab] OR tumour*[tiab] OR malignan*[tiab].ti,ab,kw. | 4174383 | 09:48:35 |
| #2     | Add            | Search "Family Practice"[Mesh] OR "Primary Health Care"[Mesh] OR "Physicians, Primary Care"[Mesh] OR "Physicians, Family"[Mesh] OR "General Practitioners"[Mesh] OR "General Practice"[Mesh] OR family practi*[tiab] OR family care*[tiab] OR family healthcare*[tiab] OR family health care*[tiab] OR primary care*[tiab] OR primary healthcare*[tiab] OR primary health care*[tiab] OR general practi*[tiab] OR GP*[tiab] OR GP*[tiab] OR PCP*[tiab] OR PCP*[tiab] OR family doctor*[tiab] OR family physician*[tiab].ti,ab,kw. | 404255 | 09:48:49 |
| #3     | Add            | Search "Cohort Studies"[Mesh] OR "Aftercare"[Mesh] OR follow-up*[tiab] OR followup*[tiab] OR aftercare*[tiab] OR after-care*[tiab] OR surveillance*[tiab] OR post-operat*[tiab] OR postoperat*[tiab] OR post-surg*[tiab] OR postsurg*[tiab] OR post-treatment*[tiab] OR posttreatment*[tiab] OR checkup*[tiab] OR check up*[tiab].ti,ab,kw. | 3096777 | 09:49:12 |
| #4     | Add            | Search "Secondary Care"[Mesh] OR "Secondary Prevention"[Mesh] OR dermatologist*[tiab] OR oncologist*[tiab] OR surgeon*[tiab] OR gastroenterologist*[tiab] OR urologist*[tiab] OR specialistled*[tiab] OR secondary care*[tiab] OR secondary healthcare*[tiab] OR secondary health care*[tiab] OR hospital care*[tiab] OR hospital follow up*[tiab] OR hospital-based follow-up*[tiab] OR cancer center*[tiab] OR speciallist care*[tiab].ti,ab,kw. | 290700 | 09:48:59 |
| #5     | Add            | Search (((#1) AND #2) AND #3) AND #4 Sort by: Publication Date | 1385 | 09:49:37 |

After removal of duplicates, a total of 1766 studies were screened on title and abstract.
Appendix 2

Table 5  Risk of bias assessment

| Study                          | Random sequence generation (selection bias) | Allocation concealment (selection bias) | Blinding of participants and personnel (performance bias) | Blinding of outcome assessment (attrition bias) | Incomplete outcome data (attrition bias) | Selective reporting (reporting bias) | Other bias | Overall bias |
|-------------------------------|--------------------------------------------|----------------------------------------|----------------------------------------------------------|-----------------------------------------------|----------------------------------------|-------------------------------------|------------|-------------|
| Augstad et al. 2013           | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Grunfeld et al. 1996, 1999 and 1999 | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Grunfeld et al. 2006          | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Mutchie et al. 2010           | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Wallach et al. 2006           | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Baena-Canada et al. 2013      | ?                                          | ?                                      | ?                                                        | ?                                             | ?                                      | ?                                   | ?          | ?           |
| Haggstrom et al. 2009         | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Malo et al. 2013              | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Mittmann et al. 2018          | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Parry et al. 2015             | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Peixoto et al. 2014           | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Railton et al. 2015           | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Risendal et al. 2016          | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |
| Samawi et al. 2018            | ●                                          | ●                                      | ●                                                        | ●                                             | ●                                      | ●                                   | ●          | ●           |

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References

1. Knottnerus JA, Wijffels JF. SCK of KWF Kankerbestrijding. Aftercare in cancer: the role of primary care. Dutch Cancer Society’s Signalling Committee on Cancer. 2011.
2. Hewitt M, Greenfield S, Stovall E. From Cancer patient to Cancer survivor: lost in transition. Washington, DC: National Academies Press; 2006.
3. Aziz NM. Cancer survivorship research: state of knowledge, challenges and opportunities. Acta Oncologica (Stockholm, Sweden). 2007;46(4):417–32. https://doi.org/10.1080/02841860701367878.
4. Khan NF, Watson E, Rose PW. Primary care consultation behaviours of long-term, adult survivors of cancer in the UK. Br J Gen Pract. 2011;61(584):197–9. https://doi.org/10.3399/bjgp11X561195.
5. Fidjeland HL, Vistad I, Gjelstad S, Brekke M. Exploring why patients with cancer consult GPs: a 1-year data extraction. BJGP open. 2019. https://doi.org/10.3399/bjgpopen19X101663.
6. Duineveld LA, Mollthof H, Wielandt J, van de Ven AW, Busschers WB, van Weert HC, et al. General practitioners’ involvement during survivorship care of colon cancer in the Netherlands: primary health care utilization during survivorship care of colon cancer, a prospective multicentre cohort study. Fam Pract. 2019;36:765–70. https://doi.org/10.1093/fampra/cmz028.
7. Brandenbarg D, Roorda C, Groenhof F, de Bock GH, Berger MY, Berendsen AJ. Primary healthcare use during follow-up after curative treatment for colorectal cancer. European Journal of Cancer Care. 2017;26(3). https://doi.org/10.1111/ecc.12581.
8. Demagny L, Holtedahl K, Bachimont J, Thorsen T, Letourmy A, Bungener M. General practitioners’ role in cancer care: a French-Norwegian study. BMC Research Notes. 2009;2:200. https://doi.org/10.1186/1756-0500-2-200.
9. Kenzik KM. Health care use during cancer survivorship: review of 5 years of evidence. Cancer. 2019;125(5):673–80. https://doi.org/10.1002/cncr.31852.
10. Rubin G, Berendsen A, Crawford SM, Dommett R, Earle C, Emery J, et al. The expanding role of primary care in cancer control. Lancet Oncol. 2015;16(12):1231–72. https://doi.org/10.1016/S1470-2045(15)00205-3.
11. Adam R, Watson E. The role of primary care in supporting patients living with and beyond cancer. Current Opinion in Supportive and Palliative Care. 2018;12(3):261–7. https://doi.org/10.1097/spc.0000000000000369.
12. Hoeg BL, Bidstrup PE, Karlsen RF, Friberg AS, Albieri V, Dalton SO, et al. Follow-up strategies following completion of primary cancer treatment in adult cancer survivors. The Cochrane Database of Systematic Reviews. 2019;2019(11). https://doi.org/10.1002/14651858.CD012425.pub2.

13. Lewis RA, Neal RD, Williams NH, France B, Hendry M, Russell D, et al. Follow-up of cancer in primary care versus secondary care: systematic review. The British Journal of General Practice. 2009;59(564):e234–47. https://doi.org/10.3399/bjgp09X453567.

14. Montgomery DA, Krupa K, Cooke TG. Alternative methods of follow up in breast cancer: a systematic review of the literature. Br J Cancer. 2007;96(11):1625–32. https://doi.org/10.1038/sj.bjc.6603771.

15. Taggart F, Donnelly P, Dunn J. Options for early breast cancer follow-up in primary and secondary care - a systematic review. BMC Cancer. 2012;12:238. https://doi.org/10.1186/1471-2407-12-238.

16. Davies NJ, Batehup L. Towards a personalised approach to aftercare: a review of cancer follow-up in the UK. Journal of Cancer Survivorship : Research and Practice. 2011;5(2):142–51. https://doi.org/10.1007/s11764-010-0165-3.

17. Higgins JP, Altman DG, Gotzsche PC, Juni P, Moher D, Oxman AD, et al. The Cochrane Collaboration’s tool for assessing risk of bias in randomised trials. BMJ (Clinical Research ed). 2011;343:d5928. https://doi.org/10.1136/bmj.d5928.

18. Sterne JA, Hernan MA, Reeves BC, Savovic J, Berkman ND, Viswanathan M, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. BMJ (Clinical Research ed). 2016;355:i4919. https://doi.org/10.1136/bmj.i4919.

19. Augestad KM, Norum J, Dhef S, Aspevik R, Ringberg U, Nestvold T, et al. Cost-effectiveness and quality of life in surgen versus general practitioner-organised colon cancer surveillance: a randomised controlled trial. BMJ Open. 2013;3(4). https://doi.org/10.1136/bmjopen-2012-002391.

20. Grunfeld E, Mant D, Yudkin P, Adewusi-Dalton R, Cole D, Stewart J, et al. Routine follow up of breast cancer in primary care: randomised trial. BMJ (Clinical Research ed). 1996;313(7058):665–9. https://doi.org/10.1136/bmj.313.7058.665.

21. Grunfeld E, Gray A, Mant D, Yudkin P, Adewusi-Dalton R, Coyle D, et al. Follow-up of breast cancer in primary care vs specialist care: results of an economic evaluation. Br J Cancer. 1999;79(7–8):1227–33. https://doi.org/10.1038/sj.bjc.6600197.

22. Grunfeld E, Fitzpatrick R, Mant D, Yudkin P, Adewusi-Dalton R, Stewart J, et al. Comparison of breast cancer patient satisfaction with follow-up in primary care versus specialist care: results from a randomized controlled trial. The British Journal of General Practice. 1999;49(446):705–10.

23. Grunfeld E, Levine MN, Julian JA, Coyle D, Szechtmann B, Minsky D, et al. Randomized trial of long-term follow-up for early-stage breast cancer: a comparison of family physician versus specialist care. Journal of Clinical Oncology. 2006;24(6):848–55. https://doi.org/10.1200/jco.2005.03.2235.

24. Murchie P, Nicolson MC, Hannaford PC, Raja EA, Lee AJ, Campbell NC. Patient satisfaction with GP-led melanoma follow-up: a randomised controlled trial. Br J Cancer. 2010;102(10):1447–55. https://doi.org/10.1038/sj.bjc.6605638.

25. Wachtow DA, Weller DP, Esterman A, Pilotto LS, McGorm K, Hammett Z, et al. General practice vs surgical-based follow-up for patients with colon cancer: randomised controlled trial. Br J Cancer. 2006;94(8):1116–21. https://doi.org/10.1038/sj.bjc.6603052.

26. Baena-Canada JM, Ramirez-Daffos P, Cortes-Carmona C, Rosado-Varela P, Nieto-Vera J, Benitez-Rodriguez E. Follow-up of long-term survivors of breast cancer in primary care versus specialist attention. Fam Pract. 2013;30(5):525–32. https://doi.org/10.1093/fampra/cmt030.

27. Haggstrom DA, Arora NK, Helft P, Clayton ML, Oakley-Girvan I. Follow-up care delivery among colorectal cancer survivors most often seen by primary and subspecialty care physicians. J Gen Intern Med. 2009;24(Suppl 2):S472–9. https://doi.org/10.1007/s11606-009-1017-6.

28. Maly RC, Liu Y, Diamant AL, Thind A. The impact of primary care physicians on follow-up care of underserved breast cancer survivors. Journal of the American Board of Family Medicine. 2013;26(6):628–36. https://doi.org/10.3122/jabfm.2013.06.120345.

29. Mittmann N, Beglaryan H, Liu N, Seung SJ, Rahman F, Gilbert J, et al. Examination of health system resources and costs associated with transitioning cancer survivors to primary care: a propensity-score-matched cohort study. Journal of Oncology Practice. 2018. https://doi.org/10.1200/jop.18.00275.

30. Parry HM, Damery S, Mulondo NP, Hazelewod P, Mskeene T, Aung S, et al. Primary care management of early stage chronic lymphocytic leukaemia is safe and effective. QJM. 2015;108(10):789–94. https://doi.org/10.1093/qjmed/hcv017.

31. Railton C, Luptchuk S, McCormick J, Zhong L, Ko JJ, Walley B, et al. Discharge to primary care for survivorship follow-up: how are patients with early-stage breast cancer faring? Journal of the National Comprehensive Cancer Network. 2015;13(6):762–71. https://doi.org/10.6004/jnccn.2015.0091.

32. Risendal BC, Sedjo RL, Giuliano AR, Vadaparampil S, Jacobsen PB, Kilbourn K, et al. Surveillance and beliefs about follow-up care among long-term breast cancer survivors: a comparison of primary care and oncology providers. Journal of Cancer Survivorship : Research and Practice. 2016;10(1):96–102. https://doi.org/10.1007/s11764-015-0454-y.

33. Sanawi HH, Yin Y, Lim HJ, Cheung WY. Primary care versus oncology-based surveillance following adjuvant chemotherapy in resected pancreatic cancer. Journal of Gastrointestinal Cancer. 2018;49(4):429–36. https://doi.org/10.1007/s12029-017-9988-8.

34. Peixoto RD, Lim HJ, Kim H, et al. Patterns of surveillance following curative intent therapy for gastroesophageal cancer. J Gastrointest Canc. 2014;45:325–33. https://doi.org/10.1007/s12029-014-9601-3.

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