An integrated care pathway for cancer patients with diabetes: A proposal from the Italian experience

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ABSTRACT

Diabetes and cancer frequently coexist in the same subject, often with relevant clinical effects on the management and prognosis of the comorbid patient. The existing guidelines, however, do not appropriately address many clinical issues in this setting. Although collaboration between diabetologists and oncologists should play an important role in achieving appropriate levels of care, close coordination or agreement between these specialists is seldom offered. There is an urgent need for greater interdisciplinary integration between all specialists involved in this setting, for a shared approach ensuring that organisational silos are overcome. To this end, the Italian Associations of Medical Diabetologists (AMD) and the Italian Association of Medical Oncology (AIOM) recently established a dedicated Working Group on 'Diabetes and Cancer'. The working group outlined a diagnostic and therapeutic clinical pathway dedicated to hospitalised patients with diabetes and cancer. In this article, we describe the Italian proposal including some suggested measures to assess, monitor

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and improve blood glucose control in the hospital setting, to integrate different specialists from both areas, as well as to ensure discharge planning and continuity of care from the hospital to the territory.

1.   Introduction

Diabetes and cancer are quite common diseases in Western countries, so it is not rare for a patient to present with both conditions at the same time. The general aging of the population also helps to explain the association between diabetes and oncological diseases, as both conditions become more common as age increases. It has been estimated that between 8% and 18% of oncology patients also have diabetes [1–6].

The presence of diabetes, in addition to significantly increasing the risk of cancer, has an unfavourable effect on the prognosis of many tumours. First of all, patients with diabetes seem to have their cancer diagnosis later than the general population (due to underuse of screening tests or due to less attention by those caring for them); also, these patients seem to undergo less aggressive treatments for cancer (for example, due to the presence of renal or neuropathic complications), which would expose them to worse responses to treatment. Among other causes, experts cite the greater prevalence of infections, increased post-surgical mortality, heightened toxicity of treatments or elevated aggressiveness of the neoplastic cells when proliferating in an environment of chronic hyperglycaemia/hyperinsulinaemia. Patients who have had diabetes for a longer time and are undergoing insulin treatments have an especially low cumulative survival rate, independent of gender and for many types of cancers [7].

Thus, diabetes management is often of crucial importance in cancer patients. Despite this evidence, there is little data on the clinical approach to take with cancer patients who have an altered glucose metabolism [8–16]. Collaboration and interaction between the different specialists involved, therefore, play a key role in achieving appropriate levels of care. Very often, in fact, diabetologists and oncologists find themselves working in an uncoordinated or contradictory manner, resulting in duplicated procedures, inappropriate admissions, delays in access to services for diabetes, improper work with less than optimal service, lack of motivation and loss of professionalism on both sides [17].

Realizing the need for health care professionals to improve the quality of care and assistance provided to people with diabetes who have oncological diseases, the Italian Association of Medical Diabetologists (AMD) and the Italian Association of Medical Oncology (AIOM) recently established a dedicated working group on 'Diabetes and Cancer', counting among its goals that of improving the quality of services offered to the comorbid patient with diabetes and cancer, to offer a staff response to the fragmentation of care, and to encourage integration, with mutual respect for each other's roles, among diabetologists and oncologists in order to improve clinical appropriateness and efficacy along with an optimisation of resources [18].

Between October 2014 and April 2015, the working group promoted and carried out a survey that involved 252 Italian physicians (diabetologists, oncologists, and palliativists). This survey provided interesting data about the critical care issues in managing cancer patients with alterations to their glucose metabolism [19]. For example, it found that:

- even though the presence of diabetes (or diabetic complications) worsens the outcome of cancer treatments, counselling or intervention by a diabetologist was only required for less than two-thirds of hospitalised patients.
- For subjects with a life expectancy of months, 80% of diabetologists considered an overly stringent blood glucose target (120–250 mg/dL) to be optimal, whereas oncologists were more likely to consider a more relaxed range (180–360 mg/dL) for patients with a shorter life expectancy.
- One participant out of 3 indicated 1–4 measurements/day as the most appropriate frequency for blood glucose monitoring, including in a palliative setting.

The data collected in the survey confirmed, on the one hand, the need for greater interdisciplinary integration to achieve a shared approach aimed at overcoming organisational issues of 'compartmentalisation'; and on the other hand, the need to ensure nationally identical standards of quality and appropriateness in managing this type of patient.

Based on these observations, the working group outlined an integrated diagnostic and therapeutic clinical pathway dedicated to the management of cancer patients with diabetes. In this position paper, we describe the Italian proposal including some suggested measures to assess, monitor and improve blood glucose control in the hospital setting, to integrate the multidisciplinary team involved in caring for this category of patient, as well as to ensure discharge planning and continuity of care from the hospital to the territory.

2.   Materials and methods

Working with the survey results, the experience gained in the Italian Piedmont and Valle d'Aosta regions (where a shared clinical pathway has been used for years in managing cancer patients with diabetes during a hospital stay and then after discharge) [20], the Italian guidelines for diabetes management [14] and the few international recommendations, AMD and AIOM formally prepared a document that was validated and approved in its final form in March 2018. This article conveys the essentials of that document.

3. Results and discussion

3.1. Aim of the clinical pathway

The purpose of this process is:

- to provide an assessment of the oncology patient with an altered glucose metabolism during the hospital stay (hospital ward, day hospital, consulting office);
- to establish an optimal, personalised plan for diabetes care in relation to the overall situation and the prognosis;
- to reduce the risks related to hyper- or hypoglycaemia during hospitalisation and the risks related to adverse events from the diabetes treatments, and to ensure the best quality of life possible;
- to make sure there is communication between the various professionals involved, as well as continuity of care upon discharge from the hospital.

Patients with diabetes become involved in an oncology setting under two circumstances: through the relevant outpatient clinic or during a stay in a specific hospital setting.

In an outpatient setting, the patient may be newly diagnosed with diabetes, often concurrent with an acute metabolic decompensation, especially due to supportive treatments with steroids, or during check-up examinations with the oncologist. In this context, it is important to be properly aware of the need to recognize patients at risk for developing diabetes, considering risk factors like obesity and family history of diabetes, and to pay attention to altered fasting blood glucose, for prompt recognition of the disease and to prevent acute decompensation events. In the latter circumstance, which it is preferable to prevent, the diabetologist consultation assumes an urgent nature and thus care pathways must be prepared that are mutually agreed upon with the hospital's diabetes clinical team.

If a diagnosis of non-decompensated diabetes takes place during an outpatient examination or at an oncology day hospital, control (even if temporary) must be taken by the diabetes team to ensure the closest consultations with the oncology staff; this possibility should also be considered for patients with previously diagnosed diabetes that is managed at another diabetes centre and agreed upon with that centre as well; in any case, it is essential to implement an expanded diabetes team that includes the oncologist due to the special circumstances surrounding the care of a oncological patient with diabetes.

Indeed, the diabetologist must re-establish the new goals for care and metabolic compensation, assessing the clinical situation, the oncological treatment plan and the prognosis, while remaining in close contact with the oncologist and the caregiver.

Often, too, a significant educational effort is required at the start of insulin treatment because of the need for increased compatibility with the potential alterations the oncology treatments induce in hepatic and/or renal functioning and the need for greater flexibility in monitoring changes in blood glucose, caused primarily by changes in diet and supportive steroid treatment.

This involves not only education on insulin therapy and self-monitoring of blood glucose at home, but also refining the therapy and the possibility of using different insulin administration strategies depending on changes in blood glucose levels related to steroid dosage, its half-life, the timing and splitting up the steroid treatment, or changes in the timing of the administration of insulin therapy depending on changed dietary needs and the ability to eat. Insulin plans and self-monitoring plans may include increased elasticity, becoming more intensive along with the cycles of oncological treatment. The educational effort is thus aimed at reaching greater empowerment of the patient through greater compliance and awareness of managing this condition.

For patients with a good prognosis, compliance with blood glucose targets and blood glucose compensation, as agreed on with the patient, should be strictly maintained. For patients with a short life expectancy, however, the priorities must focus on:

(1) different nutritional requirements,
(2) avoiding hypoglycaemia,
(3) avoiding the consequences related to hyperglycaemia (dehydration, infections, etc.),
(4) preserving quality of life by simplifying the plans for blood glucose self-monitoring and treatment.

For a patient with diabetes (whether previously known or newly diagnosed) admitted to an oncology ward, the activated hospital diabetes team will carry out its own care activities for the patient in the hospital, though the proper details of managing diabetes during the course of cancer remain valid. This activation, as in any hospital setting, is fully achieved by establishing the insulin treatment, formulating the dose correction plan during administration, avoiding 'sliding scale' insulin administration alone, preparing and sharing with the medical and nursing staff the protocols for the administration of insulin in the critical patient who cannot, must not or does not know how to feed him- or herself, preventing the clinical risk related to hypoglycaemia during hospitalisation, establishing when and how to begin insulin treatment concurrent with artificial, parenteral or enteral feeling, and finally a protected hospital discharge to the primary care physician with delivery of medications and services, instructions for insulin treatment and home self-monitoring of blood glucose, and the prescription of medications and devices.

It is essential for the diabetologist to take charge far enough in advance of discharge to educate the patient and the caregiver, as well as contacting the diabetes team that is treating or will treat the patient thereafter, where the expanded diabetes team will include the oncologist and closely involve the caregiver, and in which the diabetologist plays a central role due to the special aspects of managing the oncological diabetes patient, for urgent metabolic proce-

dures, to establish the course of treatment and the application of the diagnostic/therapeutic intra-hospital protocols, and finally to ensure continuity of care between the hospital and the territorial health care provider.

3.2.   Description of the input

Oncology patient with already known diabetes, or who develops changes in glycaemic homeostasis due to cancer treatments.

3.3.   Description of the output

- Comprehensive organisation of the oncology patient with diabetes, considering the patient's medical history, overall clinical condition, nutrition, and the prognostic and therapeutic perspectives.
- Training (of the patient and/or the caregiver) on self-monitoring of blood glucose (if needed).
- Training (of the patient and/or the caregiver) in self-management of the diabetes treatment and any episodes of decompensation (hypo- or hyperglycaemia).
- Optimal blood glucose control based on the personalised target (based on the stage of the cancer).
- 'Protected' discharge that ensures, when necessary, continuity of care with:
  - The local diabetologist.
  - The primary care physician.
  - The hospice, home care team or caregiver.

3.4.   Methodology

We propose the implementation of a facility-wide, multidisciplinary team (oncologist, haemato-oncologist, nutritionist, palliativist, radiation therapist, nursing staff) that is coordinated by the diabetologist, who receives the formal assignment from the hospital Healthcare Management to create a clinical pathway, and who is supported in writing it by the Quality Office.

The multidisciplinary group will draw up specific Responsibility Matrices based on the features of the facility in question and the available resources, in order to identify the health care professionals responsible for performing specific functions in diabetes assistance to the oncology patient during the hospital stay or during the outpatient visit. Tables 1 and 2 are examples of such matrices.

Through the multidisciplinary team identified, each centre must also provide specific operational instructions for the management of the various critical issues that may arise in each assistance setting (e.g., plans for varying insulin treatment based on blood glucose values; plans for calculating corrective doses of insulin; instructions for managing acute blood glucose decompensation in the oncology day hospital and the hospital wards; instructions for managing hypoglycaemia, etc.).

Following the drafting, the document must be shared with the personnel involved, and there must be dedicated training of the workers (Training Office). It will also be necessary to provide a regular report on the data, and to arrange for a clinical and organisational audit.

3.5.   Control points and indicators

Different control points and indicators can be identified for assessing the activities performed through the implementation of the clinical pathway. Among the possible control points, the AMD-AIOM Working Group identified the following:

- Number of cancer patients with diabetes who have limitations on cancer treatments related to the presence of diabetes;
- Number of days between the request for a diabetologist consultation and when it occurs;
- Number of days between the request and when the team performs the assessment for protected discharge;
- Cancer patients with cancer with average blood glucose levels on target (individualised based on prognosis);
- Number of hypoglycaemic episodes (<70 mg/dl);
- Number of episodes of blood glucose decompensation (>400 mg/dl);
- Number of oncological patients with diabetes trained in self-monitoring of blood glucose;
- Impact on the patient's quality of life caused by the diabetologist taking charge.

We have identified some of the possible specific indicators (descriptive, process, intermediate outcome and final outcome indicators) that can be used in analysing the efficacy of the clinical pathway, which are listed in Tables 3–6.

4.   Conclusions

Changes in glucose metabolism can be one of the metabolic complications of cancer and of the most commonly used cancer treatments. Despite the observed frequency of the two associated conditions, there is relatively little data or experts recommendations on which clinical approach to use in the oncology patient with an altered glucose metabolism. Therefore, clinical management depends largely on local habits, skills and practices, often in the absence of appropriate coordination with oncologists, haemato-oncologists, nutritionists, palliativists, and other professionals involved in caring for this category of patient.

The available data from surveys conducted in Italy and other countries document, on the one hand, the need for better interdisciplinary integration among the various healthcare providers involved in managing patients simultaneously suffering from diabetes and cancer, to achieve a shared approach that ensures overcoming organisational 'compartmentalisation', in terms of continued improvement and integration among the various professional experts. The data also show the need for all the diabetologists in a given geographic area to ensure identical quality standards and appropriateness in managing this situation.

The formation of a joint working group, one aspect of the collaboration between two of the major Italian scientific associations dealing with, respectively, diabetes treatment

Table 1 – Sample matrix of responsibilities for diabetic care of the inpatient or hospitalized oncology patient.

Activities		Functions				
What to do	Actions to take	Diab/Endo	Diab/Endo PN	Ward Oncol/Doctor	Ward PN	Other
Preliminary assessment of the oncology patient's metabolic profile, also depending on the clinical characteristics of the cancer condition and the overall outlook	Diabetes consultation with medical history and targeted assessment: performance status, nutrition, cancer treatments and supportive care, prognosis, needs for self-monitoring services and training for self-monitoring and insulin treatment, caregiver availability, care setting	R	I	I	A	Caregiver (A)
Setting blood glucose goals	Assessment of prognosis, general condition, caregiver availability	R	A	I	A	Caregiver (A)
Establishment of diabetes treatment and blood glucose monitoring plan	Establishment of personalised treatment, specific protocol application	R	A	I	I	Caregiver (A)
Creation of a nutritional programme	Nutritional history / Educational session, diet prescription	I	A	I	A	Dietitian (R), caregiver (A)
Management of acute metabolic complications (eg, diabetic ketoacidosis and hyperglycemic hyperosmolar state)	Protocol application	I	–	R	I	
Assessment of treatment needs at discharge (training, exemptions, services)	Observation and conversation with patient and/or caregiver, assessment of SMBG management ability and treatment	I	R	A	I	
Issuance of documentation for exemption document	Filling out forms	R	A	A	A	GP (A), caregiver (A)
Issuance of documentation for provision of services (glucose meter, strips, lances, needles, etc.)	Filling out forms	R	A	A	A	GP (A), caregiver (A)
Treatment education, SMBG	Procedure personalised based on needs, SMBG training, written instructions	I	R	A	A[*]	GP (A), caregiver (I)
Provision of services and medications	Direct provision for the first days of post-discharge treatment	A	I	A	R[**]	Hosp. pharmacist (I), GP (A), caregiver (A)
Assessment of treatment and management of diabetes after discharge	Diabetes consultation to establish home diabetes treatment	R	I	I	A	Territorial diab/endo (A/I)
Treatment instructions for discharge	Conversation and detailed discharge letter	A		R	A	GP (A), caregiver (A), territorial diab/endo (A), hospice personnel (A)
Scheduling a diabetes follow-up	Diary, contact with GP and territorial diab/endo (date, place and method of access to post-discharge diabetes monitoring)	R	A	I	A	GP (A), caregiver (A), territorial diab/endo (I)

R = Responsible; I = Involved; A = Advised.

Diab/Endo = Diabetologist/Endocrinologist; DH = Day Hospital; GP = General Practitioner; Oncol = Oncologist; PN = Professional Nurse; SMBG = Self-Monitoring of Blood Glucose.

[*] In some hospital wards, this may be performed by the ward nurses (if appropriately trained).

[**] In some hospital wards, this is performed by the nurses on the diabetes team.

Table 2 – Sample matrix of responsibilities for diabetes care for the oncology patient in an oncological outpatient/day hospital setting.

Activities		Functions				
What to do	How to act	Diab/Endo	DH/Outpatient Oncol/Doctor	DH/Outpatient PN	Diab/Endo PN	Other
Preliminary assessment of the oncology patient's metabolic profile, also based on the clinical characteristics of the cancer condition and the overall outlook	Diabetes consultation with medical history and targeted assessment: performance status, nutrition, cancer treatments and supportive care, prognosis, needs for self-monitoring services and training for any self-monitoring and insulin treatment, caregiver availability, care setting	R	I	A	A	
For a new diagnosis of diabetes and/or hyperglycaemia	Targeted medical history, blood and/or plasma glucose added to vital signs; HbA1c if indicated	I	R	I		
Setting blood glucose goals	Assessment of prognosis, general condition, caregiver availability	R	I	A	A	Caregiver (A)
Establishment of diabetes treatment and blood glucose monitoring plan	Establishment of personalised treatment, specific protocol application	R	I	A	I	Caregiver (A)
Creation of a nutritional plan	Nutritional history Educational session, diet prescription	I	I	A	A	Dietitian (R), caregiver (A)
Assessment of treatment needs (education, exemptions, services)	Observation and conversation with patient and/or caregiver, assessment of SMBG management ability and treatment	I	–	A	R	Caregiver (I)
Treatment education	Procedure personalised based on needs, written instructions	A	A	A	R	GP (A), caregiver (A)
Education on prevention and management of hypoglycaemia and hyperglycaemia	Treatment education, provide protocols	I	A	I	R	GP (A), caregiver (A)
Exemption document	Filling out forms	R	A	A	A	GP (A), caregiver (A)
Prescription for services	Filling out forms	R	A	A	A	GP (A), caregiver (A)
Provision of services and medications	Direct supply for the first days of treatment	I	A	A	R	GP (A), caregiver (A)
Scheduling a diabetes follow-up	Diary, contact with GP and territorial diab/endo	R	A	A	I	GP (A), caregiver (A), territorial diab/endo (I)
Provision of Diab/Endo address in case of need	Telephone, email, fax	A	A	A	R	GP (A)
Management of acute metabolic complications (eg, diabetic ketoacidosis and hyperglycemic hyperosmolar state)	Application of joint management protocols	I (R)*	I	R*	A	

R = Responsible; I = Involved; A = Advised.

Diab/Endo = Diabetologist/Endocrinologist; DH = Day Hospital; GP = General Practitioner; Oncol = Oncologist; PN = Professional Nurse; SMBG = self-monitoring of blood glucose

* The application of shared management protocols is the oncologist's responsibility; the diabetologist is responsible if no protocols exist.

Table 3 – Specific descriptive indicators.

Number of cancer patients with diabetes, out of total patients with diabetes followed-up
Number of cancer patients newly diagnosed with diabetes during outpatient or day hospital oncology visit, out of total visits performed
Number of cancer patients with previously known diabetes referred to an outpatient or day hospital oncology visit, sent for a consultation with a diabetologist, out of total patients with diabetes making an oncology visit
Number of hospital consultations performed for cancer patients with diabetes, out of total consultations performed by the Diabetology/Endocrinology Unit (or out of the hospital's total consultations for diabetes)
Number of cancer patients with diabetes with acute hyperglycaemia assessed within 2 working days of the request for a visit
Number of consultations for cancer patients performed by the diabetes team within 2 working days from the request for a consultation
Number of requests for consultation by the diabetes team that were performed more than 48 h before discharge, out of total requests
Cases of secondary diabetes, out of total patients with diabetes followed-up
Distribution of cancer patients with diabetes based on estimated life expectancy
Number of patients with acute hyperglycaemia due to failure to apply the pre-established protocol

Table 4 – Specific process indicators.

Number of cancer patients with diabetes trained in blood glucose monitoring[*] out of total oncological subjects with diabetes followed-up
Number of cancer patients with diabetes provided with a plan for blood glucose monitoring who correctly perform the blood glucose monitoring, out of total oncological subjects with diabetes followed-up
Number of cancer patients trained in self-management of insulin therapy, out of total oncological subjects with diabetes treated with insulin followed-up
Number of cancer patients with diabetes provided with an algorithm for self-titrating short-acting insulin dose, out of total oncological subjects with diabetes treated with insulin followed-up
Number of cancer patients with diabetes treated with insulin, out of total subjects with diabetes followed-up
Number of cancer patients with diabetes treated with oral antidiabetics, out of total subjects with diabetes followed-up
Average length of diabetes/oncology follow-up

[*] Self-monitoring or monitoring performed by caregiver.

Table 5 – Specific intermediate outcome indicators.

Cancer patients with diabetes with average blood glucose on target (individualised based on prognosis), out of total subjects with diabetes followed-up
Cancer patients with diabetes with repeated (>10) episodes of blood glucose >360 mg/dl in the last 3 months of life
Cancer patients with diabetes with severe hypoglycaemia in the last 3 months of life, out of total oncological subjects with diabetes followed-up
Cancer patients with diabetes with <2–3 blood glucose checks per day in the last 3 months of life, out of total oncological subjects with diabetes followed-up

Table 6 – Specific final outcome indicators.

Cancer patients with diabetes with repeated episodes (>10) of symptomatic hyperglycaemia, out of total patients with diabetes followed-up
Cancer patients with diabetes with repeated (>5) episodes of severe hypoglycaemia in the last 3 months of life, out of total patients with diabetes followed-up
Cancer patients with diabetes without dietary restrictions due to diabetes, out of total patients with diabetes followed-up
Cancer patients with diabetes whose quality of life did not worsen significantly due to diabetes, out of total cancer patients with diabetes followed-up
Number of visits to the Emergency Room due to hypoglycaemia or acute hyperglycaemia

(AMD) and oncology treatment (AIOM), had as one of its goals to provide a scientific, clinical and operational point of reference for this specific field. The recently developed integrated management pathway for the oncological patient with diabetes, dedicated to inpatients and outpatients alike, is intended as a useful tool in overcoming local health disparities and in sharing standards for essential assistance among different Italian centres.

Compliance with Ethical standards

Declaration of Competing Interest

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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Appendix A.   Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.diabres.2019.04.036.

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