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Strategic nutrition choices in hospital catering: Quality, savings and microbiological safety: Cook and chill

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Until not long ago hospital catering was - especially in public hospitals - an issue not considered a clinical priority by general management.

In the recent period however, attitudes and attention towards this service have changed, as a series of new conditions, not disconnected from each other, has been created, so that we can identify:

1. The health care reform that, with the corporatization of hospitals, has:
   a. led management to pay more attention to the individual expenditure items of the budget;
   b. encouraged a more accurate comparison between items of expenditure and results achieved in order to optimize the use of resources;
   c. launched a competitive regime among the various public and private facilities, based on the quality of services provided;
   d. favoured a consequent progressive outsourcing of activities that do not belong to the core business, in order to:
      i. better focus management resources on competitive challenge;
      ii. budget forecast the cost elements defined by contract.
2. The steady decline of public funds available in the budget to deal with the management of health facilities, including hospitals;
3. Increasing attention by users (i.e. patients and, in the case of children and the elderly, relatives too) to the overall quality of services provided, including "hotel" aspects of hospital treatment;
4. The current health legislation which indicates, in an ever more pressing way, how nutrition should be considered in all respects a care process: the need is therefore emphasized to protect the food, nutrition and hygiene choices of individual facilities;
5. The importance of the nutritional aspect from a clinical and therapeutic viewpoint, which provides tangible results in the integration between diet and therapy. For management everything affects the following aspects, as already shown by scientific studies and trials:
   a. An improvement in therapeutic efficacy;
   b. A potential decrease in hospital days per patient;
   c. Greater stability of clinical results achieved.

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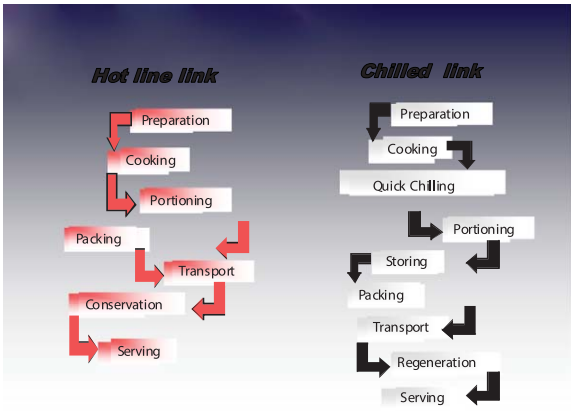

Fig. 1. The methodologies.

This leads necessarily to reconsider very carefully the aspect of catering within hospitals and hospitalization facilities. Those must be identified, in the category of technological and organizational solutions available, which best meet the needs of each individual situation, in terms not merely of costs but more generally of overall results.

Firstly below we propose to give an overview of the solutions offered by the market at present (Fig. 1).

From the technological point of view the food industry for catering currently offers two main and differing methods of production, conservation and distribution of meals, known as "hot line" and "chilled line" (the latter also known as cook & chill). [1–5].

1. The hot line

The hot line involves keeping the dishes, once cooked, at a temperature not lower than 65°C, so as to avoid the risk of microbial growth, until their actual consumption.

In this case the period of time between the end of cooking and consumption does not exceed two hours.

Compliance with these operating conditions may, however, face difficulties if the quantities required are of significant size and/or the characteristics of logistic routes require an increase in travel time.

2. The chilled line

This system provides for the rapid cooling, in two stages, to a temperature of +3°C of the cooked items and their subsequent storing in cold storage at a temperature between 0 and +3°C.

In the next phase a "regeneration" of the food takes place at +65°C, to be carried out immediately prior to their consumption.

In all the meal production systems it is fundamental to respect the following principles:

* careful selection of raw materials, which should be of good quality in microbiological, nutritional and organoleptic terms;
* proper cooking of the food, which is to ensure the destruction of vegetative forms of any pathogen microorganisms present;
* constant temperature control;
* proper conservation conditions, aimed at maintaining the characteristics of first-quality meals.

One of the fundamental differences between hot link and chilled link (cook and chill) lies in the possibility of suspending the distribution phase by subjecting the food which has just been cooked to immediate refrigeration at temperatures between 0°C and 3°C.

This methodology allows cooked foods to be preserved for periods of up to 40 days, depending on the techniques of cooking and preservation adopted.

This process requires the following steps:

* rapid cooling after cooking, in order to block the growth of micro-organisms;
* the conditions of storage and distribution for cooked food, which must ensure its quality;
* the set of procedures to be followed during the phases of regeneration and distribution of food to the user, which must ensure safety from the microbiological point of view and are also very important to ensure that the meal is enjoyable and to maintain nutritional values.

2.1. Raw materials

The foods in question are those commonly used for traditional catering.

With reference to the same, the key distinction is that in the Cook & Chill system all raw materials must be strictly top quality, to avoid compromising success. This rule also applies to the frozen products used in production.

The quality of the raw materials at the time of their arrival in the kitchen should be first choice and controlled.

It is therefore necessary to create a control phase both for the conditions under which the goods are delivered, as well as for the professionalism of the staff employed by the supplier for produce handling.

2.2. Cooking

The time/temperature combination in the cooking process must be sufficient to ensure the penetration of heat to the centre of the food to obtain the destruction of non-spore-forming pathogens.

2.3. Chilling

To preserve the appearance, taste, nutritional qualities and safety of the cooked food, the chilling process should begin as close as possible to the end of the cooking stage.

The food must be cooled to a temperature between 0°C and +3°C, by means of specific equipment for rapid cooling.

2.4. Storage

The storage facilities must permit:

- the pre-chilling of the dishes and the trolleys (where used);
- the storage and preservation of cooked foods;
- the storage and preservation of food;
- proper stock rotation;

The conservation cells must have a chilling power capable of ensuring temperatures for preserving the products which will remain between 0°C and +3°C.

2.5. Transport

The conveyance stage of the refrigerated foods is the part of the process most difficult to control, being the one most subject to temperature fluctuations.

In this phase it is essential that the temperature does not rise above that set for food storage.

The main types of refrigeration of the vehicles are the following:

1) Insulated vehicle in which cold CO2 gas is put into circulation;
2) Insulated vehicle in which nitrogen is made to circulate in gaseous form;
3) Insulated vehicle in which chilled air is circulated by a refrigeration unit;
4) Insulated vehicle in which a pre-frozen slab is inserted.

2.6. Regeneration

The foods intended for supply after regeneration must be distributed regenerated in the shortest possible time.

Failure to observe this rule cancels the basic objective of the Cook & Chill system.

Food regeneration must be done in the vicinity of the distribution point.

In fact the refrigerated food, after having been regenerated and subjected to the regeneration process, is sensitive both to contamination and to the loss of nutritional value and organoleptic characteristics, in the same manner of traditionally prepared food.

2.7. Equipment

The equipment used must allow higher productivity, even if the same is concentrated in a smaller number of days during the week.

The technology of most of the equipment, which allows programming of the processing and/or cooking steps, enables the constraints of time/temperature fundamental in the success of the Cook & Chill system to be respected.

Of particular importance is the function of the cold storage and the chilling of the process environments: these must meet certain constant temperature requirements.

The main regeneration systems use the following technical methods:

- in water
- convection
- induction
- contact

Regeneration by convection is the technique which allows food to be brought to the desired temperature by means of forced ventilation of hot air within a temperate environment.

The equipment present on the market allows, during the distribution phase, to carry out the regeneration of the foods according to the specific needs of the system chosen, namely:

- using **trays**, mainly in hospitals
- using a **multi-portion** system, in nursing homes, schools and canteens.

2.8. Planning checks

Regarding food safety, both production technologies require checks to be applied on raw materials, on the intermediate stages of the production cycle and on the finished products, in order to assess the nutritional, hygienic and sensory aspects Fig. 2.

In fact our previous experiences have shown that bacterial growth is not present even after 70–90 minutes from the end of regeneration, at temperatures lower than 60°C [6].

For this experience temperature monitoring was carried out, continuously (every 5 minutes) and by batch (at 20, 45 and 60 minutes), in the core of the products at the end of the regeneration cycle, performed with the aid of a trolley (chamber at 100°C; cycle of 50 minutes).

The analyses involved samples of first courses, second courses and hot vegetables, all in sealed single-portion packages ($n = 30 \times 3$) and, for each of these, microbiological tests (CBT and coliforms at 30°C, *E.Coli, Staphylococci* coag. pos, *Salmonella spp* and sulphite reducing anaerobes, *Bacillus cereus*). For each sample 3 tests of the same batch were performed in different positions of storage on the trolley (pos1 = high; pos2 = medium; pos3 = low and maximum capacity per side: 15 trays).

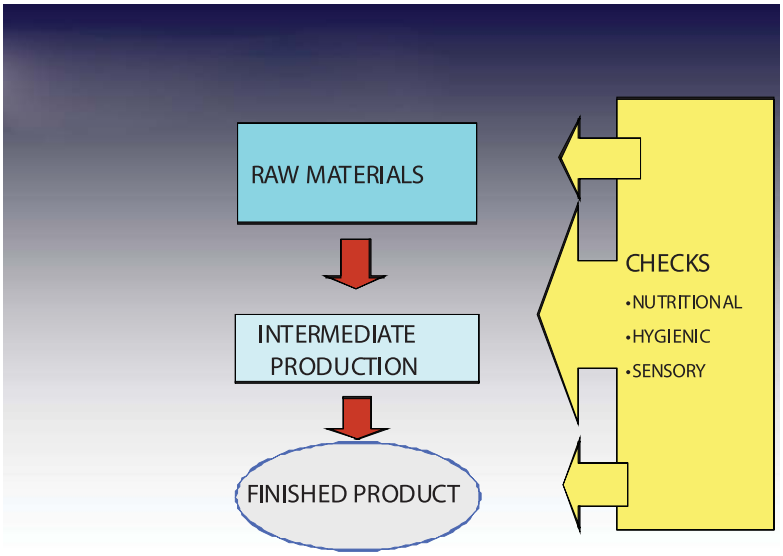

Fig. 2. Planning checks.

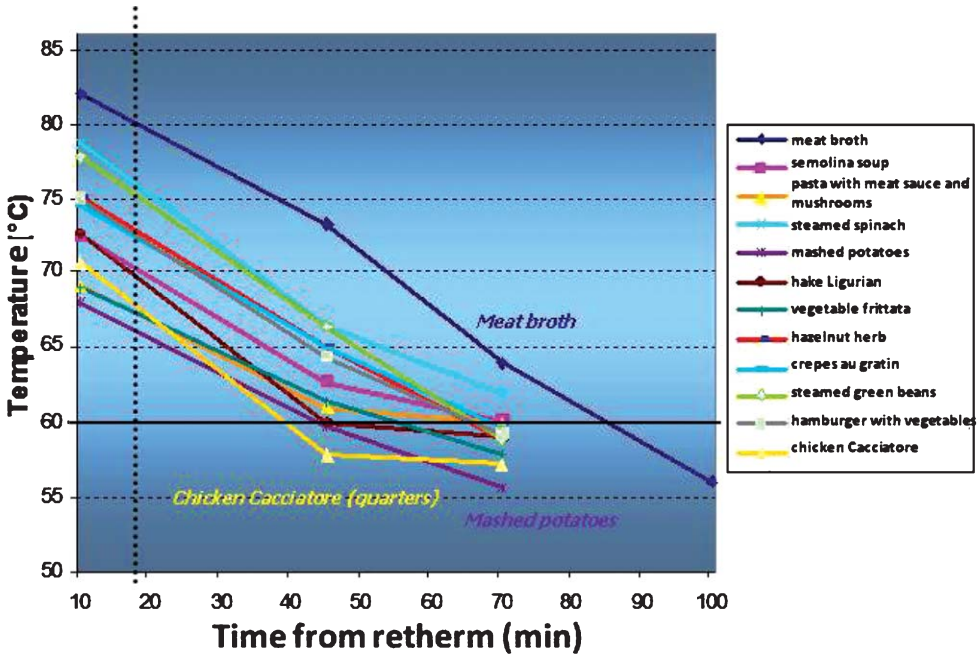

Fig. 3. Temperature decay after regeneration.

All analysed samples maintained their temperature above 60°C (*Critical Control Point in the conservation-distribution phase – HACCP methodology*) during the distribution of meals and up to 30 minutes, regardless of their initial position (see following Fig. 3). In the post-distribution "limit" tests ($t > 20$ minutes), after the closing of the trolley, the temperature begins to drop and variability was noted in the thermal decay depending on the placement of the tray on the trolley and the physical characteristics of the product (thickness, density).

Moreover, the microbiological results obtained confirmed the thermal checks, highlighting that bacterial growth was not present even after 70–90 minutes from the end of regeneration at temperatures below 60°C.

From this it may be suggested that the dishes in the hot link should be positioned and then closed on the high side of the trolley in order to lengthen the time of conservation at above 60°C so that a complete and safe meal can be supplied from the microbiological point of view [6].

Therefore, strict application of proper hygienic and sanitary practices during all phases (HACCP methodology) together with high standards of raw materials and constant staff training enable high microbiological safety for the end product, even after the prescribed distribution times on the ward [7–9], to be ensured in a "cook & chill" production system.

It should be remembered that, as with any catering service, the practice of consuming meals a short time after regeneration allows a high level of organoleptic quality of the dishes to be maintained.

Briefly, we can say that the first preparation technique (hot link) is the most simple from the technological point of view, in addition to being the one longest in use and also more widespread, especially in medium/small facilities.

The second preparation technique (chilled link), more technologically complex but able to provide higher levels of quality, started by some airlines after World War II, was developed in the 70 s and regulated first in France in '74 and progressively adopted by medium/large facilities. In the face of increased complexity, the chilled line provides greater versatility, in that cold storage allows the food to be kept for a longer period of time and, therefore, to have a wider variety of food at any moment and to deal more easily with possible emergencies or critical situations that may affect the supply chain (strikes, unfulfilled or defective supplies and breakdowns).

The main objective of both technologies is, of course, in addition to that of producing meals which are satisfactory organoleptically, nutritionally and to the palate, to avoid contamination of the food by external agents, more or less pathogens (bacteria, viruses, insects, chemical substances and so on), which can cause decay through chemical and microbiological phenomena triggered by inadequate or excessive conservation.

To this end there are precise legal provisions and regulations as regards storage and production premises, techniques for processing and distribution, the separation of the clean cycle and the dirty cycle, clothing, the behaviour and state of health of personnel concerned.

It is also clear that, in the health sector, the emphasis on hygiene and organoleptic aspects must be much greater, because the service is aimed at "weak" subjects, often more or less deficient in adequate immunity defence and in need of specific nutritional intake.

From a management perspective, as for many other activities which are essential but outside the company's core business, there is a series of options ranging from the management of the hospital catering entirely in-house to total outsourcing. Without going into details, however, obvious to most administrators, and without wishing to suggest solutions which are universally valid, it is perhaps appropriate to mention two things on the subject that seem not to be of secondary interest.

First, the issue of quality control, which must be systematically carried out both on receipt of the goods (check on delivery), and also at the time of production, and during conservation or storage of the cooked product, and at the time of distribution (check on the finished product). These checks must include environments, people, quality and quantity of the portions, the serving temperature, and the correct application of special dietary requirements and the compliance of the food distributed to the menu where selected by the user.

Since it is a well established company rule that controller and controlled should belong to different entities, the checks are likely to be less effective in the case of totally internal service management or complete outsourcing of the same.

In particular, in the hospital catering dimension, in the case of catering contracted out to a specialized outside firm, checking should remain entirely in the hands of an internal facility of the Client Entity: this is not only to maintain the standards high and absolutely constant, but also because this is the only way to ensure effective integration between diet and therapy. Moreover, it is precisely at the level of dietary and nutritional food control, and its adequacy in general and in specific clinical situations, that a hospital has the necessary and appropriate dietary and medical knowledge: delegating this function to third parties would therefore implicitly impoverish the quality of the service offered.

The other element of interest is the recent introduction of so-called "result-based contracts", where the subject of execution is not a mere provision of services, but a true partnership between customer and supplier, with clearly defined

results to be achieved. This innovative form of contract allows effective integration - operational and budgetary - between the core business of the customer and the activities subcontracted, by allowing better exploitation of supplier know-how in respect of a scientific, regulatory and technological company continuously evolving, without rigidly constricting the service provided to rigid patterns and products which might soon become obsolete.

From the above it is clear that a proper hospital catering system must meet the following criteria, each representing an aspect of *quality*:

- Being fully compliant with the regulations and rules on catering, as well as the further hygienic norms congruent with a health facility (technological quality);
- Being integrated with the therapeutic prescriptions and therefore flexible depending on the clinical needs (therapeutic quality);
- Having costs, objectives and results measurable in terms of cost and operating result (quality management);
- Being compatible and/or justifiable with the economic resources available (economic quality);
- Ensuring a high degree of satisfaction for users (perceived quality).

It is now a question whether these requirements are compatible, particularly if higher quality does not lead to rising costs in the face of increasingly diminishing funds available.

First it is necessary to note that poor quality involves inefficiency, and inefficiency has a cost, not only on the social level (never negligible for a health care facility), but also on the management and, ultimately, economic level. Poor quality imposes waste, complaints, potential therapeutic complications (resulting in increased hospital days), inappropriate use of resources, in particular human resources: all things that produce management overloading, time wasted by staff to handle protests and complaints, additional costs to deal with active or passive claims for compensation. Moreover, this results in a deterioration of image, which involves, in a competitive health system, a reduction in competitive advantage and thus revenue.

Conversely, a system based on quality, eliminating or greatly reducing its inefficiencies, and therefore waste in terms of material and human resources, allows for better management of the available resources, producing a positive public image. In addition, recent experiences show that a quality catering service can also be sold outside, placing on the market part of the production in appropriate facilities and thus becoming an additional source of income.

In conclusion, if it is true that quality has a higher cost on the product (at a closer look not so high as people might think), it is not at all certain that this higher cost, with an appropriate choice, does not become, in the medium term, a greater saving of resources, better company organization, an increased therapeutic efficacy, an enhancement of image and, ultimately, more revenue.

References

[1] Department of Health-Chilled and Frozen. Guidelines on Cook-Chill and Cook-freeze Catering System. London: HMSO 1989;

[2] Authority of Ireland, Cook-Chill System in the food service sector rev.1-2006;

[3] P.J. Wilkinson et al., Cook-Chill, Cook-freeze, Cook hold, sous-vide: Risk for hospital patients? Public Health Laboratory and Hotel Service Dep., Derriford Hospital, Plymouth.1991;

[4] Codex Alimentarius Commission CAC/RCP 39. Code of hygienic practice for precooked and foods in mass catering. 1993;

[5] European Commission (2005) REG.CE 2073/05, 852/04, 853/04 and subs.

[6] Derin L, Nanetti E, Sukkar SG. Monitoraggio termico e microbiologico dei pasti rigenerati nella Modalità cook and chill. ADI magazine. 2008;(4):573-4.

[7] Sandys GH, Wilkinson PJ. Microbiological evaluation of a hospital delivered meals service using precooked chilled foods. Public Health Laboratory, Derriford Hospital, Plymouth-1993.

[8] Shanaghy N, Murphy F, Kennedy K. Improvements in the microbiological quality of food samples from a hospital cook-chill system since the introduction of HACCP. Microbiology Department, Waterford Regional Hospital, Ardkeen, Ireland.1996