References: Diabetes Type 2

REF ID: 382

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Agreement to collaborate on diabetes measures marks a giant step forward: All parties can look forward to many benefits from a single-source data collection approach.(2001). ***Joint Commission Benchmark, 3*****(8), 1-2, 10.**

Journal Article, Tables/Charts

REF ID: 383

QM: Quality Measures

Topic 5: Evaluation/Follow-up

AMA, JCAHO, NCQA release diabetes care measures... american medical association... joint commission on accreditation of healthcare organizations... national committee for quality assurance.(2001). ***Case Management Advisor, 12*****(9): RESOURCE BANK), nsert 1, 144.**

Journal Article, CEU, Exam Questions, Website

REF ID: 359

Level II: Individual experimental study

Topic 1: Risks

Almdal, T., Scharling, H., Jensen, J. S., & Vestergaard, H. (2004). The independent effect of type 2 diabetes mellitus on ischemic heart disease, stroke, and death: A population-based study of 13,000 men and women with 20 years of follow-up. ***Archives of Internal Medicine, 164*****(13), 1422-1426.**

Clinical Trial. Journal Article. Randomized Controlled Trial

BACKGROUND: Epidemiological studies have reported that patients with type 2 diabetes mellitus (DM) have increased mortality and morbidity from cardiovascular diseases, independent of other risk factors. However, most of these studies have been performed in selected patient groups. The purpose of the present study was prospectively to assess the impact of type 2 DM on cardiovascular morbidity and mortality in an unselected population. METHODS: A total of 13,105 subjects from the Copenhagen City Heart Study were followed up prospectively for 20 years. Adjusted relative risks of first, incident, admission for, or death from ischemic heart disease, acute myocardial infarction, or stroke, as well as total mortality in persons with type 2 DM compared with healthy controls, were estimated. RESULTS: The relative risk of first, incident, and admission for myocardial infarction was increased 1.5- to 4.5-fold in women and 1.5- to 2-fold in men, with a significant difference between sexes. The relative risk of first, incident, and admission for stroke was increased 2- to 6.5-fold in women and 1.5- to 2-fold in men, with a significant difference between sexes. In both women and men the relative risk of death was increased 1.5 to 2 times. CONCLUSIONS: In persons with type 2 DM, the risk of having an incident myocardial infarction or stroke is increased 2- to 3-fold and the risk of death is increased 2-fold, independent of other known risk factors for cardiovascular diseases.

REF ID: 388

Level II: Individual experimental study

Topic 1: Risks

Berthet, K., Neal, B. C., Chalmers, J. P., MacMahon, S. W., Bousser, M. G., & Colman, S. A. et al. (2004). Reductions in the risks of recurrent stroke in patients with and without diabetes: The PROGRESS trial. ***Blood Pressure, 13*****(1), 7-13.**

Clinical Trial; Journal Article; Multicenter Study; Randomized Controlled Trial; IM

BACKGROUND: Analyses of the risks of stroke were conducted for subjects with and without diabetes, participating in a randomized, double-blind, placebo-controlled trial of a perindopril-based blood pressure lowering regimen in 6105 people with prior stroke or transient ischaemic attack (TIA), followed for a median of 3.9 years. FINDINGS: Seven hundred and sixty-one patients had diabetes at baseline. Diabetes increased the risk of recurrent stroke by 35% (95% CI 10-65%) principally through an effect on ischaemic stroke (1.53, 95% CI 1.23-1.90). Active treatment reduced blood pressure by 9.5/4.6 mmHg in patients

with diabetes and by 8.9/3.9 mmHg in patients without diabetes. The proportional risk reductions achieved for stroke in patients with diabetes, 38% (95% CI 8-58%), and patients without diabetes, 28% (95% CI 16-39%), were not significantly different (p homogeneity = 0.5). The absolute reduction in the risk of recurrent stroke in the patients with diabetes was equivalent to one stroke avoided among every 16 (95% CI 9-111) patients treated for 5 years. CONCLUSIONS: Diabetes is an important risk factor for stroke in patients with established cerebrovascular disease. Treatment with the ACE inhibitor perindopril with discretionary use of the diuretic indapamide produced reductions in the risk of recurrent stroke in patients with diabetes that were at least as great as those achieved in patients without diabetes.

REF ID: 352

Level IV: Non-experimental study

Topic 1: Risks

Bruce, D. G., Davis, W. A., & Davis, T. M. E. (2000). Glycemic control in older subjects with type 2 diabetes mellitus in the fremantle diabetes study. *Journal of the American Geriatrics Society, 48*(11), 1449-1453.

Journal Article, Research, Tables/Charts

OBJECTIVES: We investigated whether there were differences in glycemic control in older compared with younger subjects with type 2 diabetes mellitus enrolled in the Fremantle Diabetes Study, a prospective study of diabetes care, control, and complications in an urban setting. DESIGN: Cross-sectional observational study. SETTING: University teaching hospital clinical research center. PARTICIPANTS: A total of 1,205 patients with type 2 diabetes mellitus, 404 (33.3%) of whom were aged over 70 years and 83 (6.9%) aged over 80 years. MEASUREMENTS: Fasting plasma glucose, HbA1c, body mass index, and waist/hip ratio. RESULTS: In multiple linear regression analysis, age was inversely associated with glycemic control whereas duration of diabetes and treatment with either oral hypoglycemic agents or insulin were positively associated with glycemic control. For most age groups there was a significant worsening of glycemic control with duration of diabetes. Octogenarians differed significantly from younger age groups in that those with longer diabetes duration did not demonstrate the increase in hyperglycemia seen in other age groups. As a result, significantly greater proportions of these oldest diabetic subjects had satisfactory glycosylated hemoglobin levels compared with younger subjects. CONCLUSIONS: Octogenarians do not demonstrate the usual progressive deterioration of glycemic control with diabetes duration seen in type 2 diabetes mellitus. The reasons for this difference are unknown but are likely to have clinical significance with regard to therapy and the development of diabetic complications.

REF ID: 363

Level II: Individual experimental study

Topic 1: Risks

Topic 4: Management

Bunout, D., Barrera, G., de la Maza, P., Gattas, V., & Hirsch, S. (2003). Seasonal variation in insulin sensitivity in healthy elderly people. *Nutrition, 19*(4), 310-316.

Clinical Trial. Journal Article. Randomized Controlled Trial

OBJECTIVE: There is a seasonal variation in the incidence of diabetes mellitus and cardiovascular diseases. However, there is very little information about the seasonal variation in insulin sensitivity. We report the seasonal variation in insulin sensitivity in a group of elderly subjects followed for 1 y. METHODS: Healthy elderly (>/=70 y) subjects living independently were included. Fifty percent of subjects received a daily nutritional supplement that provided 400 kcal, 15 g of protein, and 50% of vitamin daily reference values (DRVs). Those receiving and not receiving supplements were randomly assigned to a resistance exercise training program. Every 6 mo (winter, summer, and winter), body composition was measured by dual-energy x-ray absorptiometry and blood samples were used to measure serum lipids, fasting and postprandial glucose, and insulin levels. RESULTS: One hundred eight subjects (31 supplemented and trained, 28 supplemented, 16 trained, and 33 without supplementation or training) completed the follow up. Higher homeostasis assessment of insulin sensitivity, postprandial insulin, and fasting triacylglycerol levels were observed during the summer than during the winter. Body fat increased steadily during the study period, and fat-free mass did not change. Serum low-density lipoprotein

cholesterol decreased significantly in the supplemented and trained group and increased in the non-intervention group. CONCLUSIONS: In this group of elderly subjects, insulin resistance and triacylglycerol levels were higher during the summer. Nutritional supplementation and training had a positive effect on serum low-density lipoprotein cholesterol.

REF ID: 377

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Campbell, S. M., Roland, M. O., Shekelle, P. G., Cantrill, J. A., Buetow, S. A., & Cragg, D. K. (1999). Development of review criteria for assessing the quality of management of stable angina, adult asthma, and non-insulin dependent diabetes mellitus in general practice. *Quality in Health Care, 8*(1), 6-15.

Journal Article

OBJECTIVE: To develop review criteria to assess the quality of care for three major chronic diseases: adult asthma, stable angina, and non-insulin dependent diabetes mellitus. SUBJECTS AND METHODS: Modified panel process based upon the RAND/UCLA (University College of Los Angeles) appropriateness method. Three multiprofessional panels made up of general practitioners, hospital specialists, and practice nurses. RESULTS: The RAND/UCLA appropriateness method of augmenting evidence with expert opinion was used to develop criteria for the care of the three conditions. Of those aspects of care which were rated as necessary by the panels, only 26% (16% asthma, 10% non-insulin dependent diabetes, 40% angina) were subsequently rated by the panels as being based on strong scientific evidence. CONCLUSION: The results show the importance of a systematic approach to combining evidence with expert opinion to develop review criteria for assessing the quality of three chronic diseases in general practice. The evidence base for the criteria was often incomplete, and explicit methods need to be used to combine evidence with expert opinion where evidence is not available.

REF ID: 351

Level IV: Non-experimental study

Topic 1: Risks

Topic 3: Assessment

Cheng, T. Y. L., & Boey, K. W. (2000). Coping, social support, and depressive symptoms of older adults with type II diabetes mellitus. *Clinical Gerontologist, 22*(1), 15-30.

Journal Article, Research, Tables/Charts

This study examined the effects of coping and social support on the adaptation to Type 11 diabetes mellitus of elderly Chinese patients. The age of the subjects (N = 200) ranged from 60 to 92 years (mean = 70.96, SD = 5.84). The duration of illness since its first detection ranged from half a year to 36 years (mean = 9.14, SD = 6.95). Data were collected in face-to-face interviews with a structured questionnaire. The results indicated that the patients did not perceive diabetes as severely threatening to their daily activities. Compared with a normal sample of elderly people, these diabetic elderly patients did not exhibit a higher level of depressive symptoms as measured by GDS-15. Concealment of feelings was most significantly associated with depressive symptoms. General social support appeared to be more beneficial than diabetic-specific support. Support from friends played a more significant role in the adaptation to diabetes mellitus than support from family network.

REF ID: 356

Level IV: Non-experimental study

Topic 1: Risks

Chyun, D., Obata, J., Kling, J., & Tocchi, C. (2000). In-hospital mortality after acute myocardial infarction in patients with diabetes mellitus. *American Journal of Critical Care, 9*(3), 168-179.

Journal Article, Research, Tables/Charts

OBJECTIVES: To examine in-hospital mortality after acute myocardial infarction in patients with diabetes mellitus. METHODS: All patients in an 800-bed teaching hospital who had a discharge diagnosis of myocardial infarction, verified by creatine kinase levels at admission, between 1991 and 1993 made up the study population. All 118 such patients who died during this period made up the case group. Two control subjects (n = 236), survivors of the hospitalization, matched by sex, age, and length of hospitalization, were

selected randomly for each case. Information on the presence of diabetes mellitus, medical history, and data related to myocardial infarction were obtained through retrospective chart review. RESULTS: The mean age of all subjects in the study was 76 years. Thirty-three percent of the patients in the case group and 31% of the control subjects had a history of diabetes mellitus (odds ratio = 1.04; 95% CI, 0.64-1.70), indicating that diabetes mellitus was not associated with an increased risk of in-hospital death. The adjusted odds ratio was 1.10 (95% CI, 0.48-2.51) in patients with non-insulin-treated diabetes mellitus and 0.80 (95% CI, 0.34-1.86) in insulin-treated patients. Multivariate analysis, with conditional logistic regression, confirmed that known prognostic factors for myocardial infarction, rather than diabetic status, are predictive of in-hospital mortality. CONCLUSIONS: Once the effects of age are accounted for, the risk of in-hospital mortality is not greater in patients with diabetes mellitus than in patients without diabetes; however, diabetes mellitus may be an important factor for long-term survival.

REF ID: 386

Level IV: Non-experimental study

Topic 4: Management

Clark, M., & Hampson, S. E. (2001; 2001). Implementing a psychological intervention to improve lifestyle self-management in patients with type 2 diabetes. *Patient Education and Counseling, 42*(3), 247-256.

Journal; Peer Reviewed Journal

Lifestyle and behavioral factors play an important role in the development of Type 2 diabetes and management of this illness involves a combination of medication and lifestyle change. The present study with 100 patients (aged 40-70 yrs) aimed to evaluate a brief self-management psychological intervention that can be integrated into routine usual care to assist people to make the recommended lifestyle changes. Ss were allocated to either an intervention or usual care control group. The intervention included assessment and a personalized program in which realistic manageable goals for lifestyle change and overcoming barriers are negotiated using brief motivational interviewing. Maintenance issues were addressed by follow-up telephone contact at 1 and 3 wks. Baseline data presented on initial Ss indicated that satisfaction and program acceptance were high. (PsycINFO Database Record (c) 2005 APA, all rights reserved)

REF ID: 331

Level IV: Non-experimental study

Topic 1: Risks

Topic 3: Assessment

Collin, H., Niskanen, L., Uusitupa, M., Toyry, J., Collin, P., & Koivisto, A. et al. (2000). Oral symptoms and signs in elderly patients with type 2 diabetes mellitus: A focus on diabetic neuropathy. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics, 90*(3), 299-305.

Journal Article, Research, Tables/Charts

OBJECTIVE: We investigated oral disorders and compared the findings with the occurrence of neuropathy in type 2 diabetes mellitus. STUDY DESIGN: Mucosal diseases, tooth loss, and temporomandibular joint dysfunction were examined in 45 patients with long-term type 2 diabetes mellitus and in 77 control subjects. The occurrence of neuropathy was evaluated by neurophysiologic tests. RESULTS: Of patients with diabetes, 56% suffered from dry mouth and 18% from glossodynia; of controls, correspondingly, 36% and 7% (P <.05); 2 or more mucosal lesions were detected in 42% and 20%, respectively (P =. 008). Temporomandibular joint dysfunction was found in 27% of subjects with diabetes and in 16% of control subjects. Peripheral neuropathy was present in 42% of patients with diabetes and in none of the controls (P <.01), and autonomic parasympathetic neuropathy in 54% and 31%, respectively (P =.02). Peripheral and autonomic parasympathetic neuropathies were independent risk factors for tooth loss and temporomandibular dysfunction. CONCLUSIONS: Diabetic neuropathy was found to be associated with tooth loss and temporomandibular joint dysfunction.

REF ID: 380

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Cradock, S. (2004). Type 2 diabetes and the GMS contract -- how to make the best use of the

performance indicators to help your patients and your practice. ***Practice Nurse, Supplement,*** **1-8.**
Journal Article, Tables/Charts

REF ID: 361

Level IV: Non-experimental study

Topic 1: Risks

de Rekeneire N. Rooks RN. Simonsick EM. Shorr RI. Kuller LH. Schwartz AV. Harris TB. Health,Aging and Body Composition Study. (2003). Racial differences in glycemic control in a well-functioning older diabetic population: Findings from the health, aging and body composition study.[see comment][erratum appears in diabetes care. 2003 dec;26(12):3368]. ***Diabetes Care, 26*****(7), 1986-1992.**

Journal Article. Multicenter Study

OBJECTIVE: To evaluate racial differences and factors associated with worse glycemic control in well-functioning older individuals with type 2 diabetes. Our hypothesis was that glycemic control would be worse among black than white diabetic individuals but that this association would be explained by differences in severity of diabetes, health status, health care indicators, and social, psychological, or behavioral factors. We further hypothesized that the association of race with poorer glycemic control would be limited to those with lower education or lower income. RESEARCH DESIGN AND METHODS: Cross-sectional analysis of 468 diabetic participants among a cohort of 3,075 nondisabled blacks and whites aged 70-79 years living in the community enrolled in the Health, Aging and Body Composition Study. Glycemic control was measured by the level of HbA(1c). RESULTS: A total of 58.5% of the diabetic individuals were black. Although control was poor in all diabetic participants (HbA(1c) > or =7% in 73.7%), blacks had worse glycemic control than whites (age- and sex-adjusted mean HbA(1c), 8.4% in blacks and 7.4% in whites; P < 0.01). Race differences in glycemic control remained significant, even after adjusting for current insulin therapy, cardiovascular disease, higher total cholesterol, and not receiving a flu shot in the previous year, all of which were associated with higher HbA(1c) concentrations. Controlling for these factors reduced the association by 27%. Race remained an important factor in glycemic control, even when results were stratified by education or income. CONCLUSIONS: HbA(1c) concentrations were higher in older black diabetic individuals. Differences in glycemic control by race were associated with disease severity, health status, and poorer quality of care, but these factors did not fully explain the higher HbA(1c) levels in older black diabetic individuals.

REF ID: 336

Level IV: Non-experimental study

Topic 1: Risks

Topic 4.3: Management-Medication

Dunning, T., & Manias, E. (2005). Medication knowledge and self-management by people with type 2 diabetes. ***Australian Journal of Advanced Nursing, 23*****(1), 7-14.**

Journal Article, Research, Tables/Charts

Objective: To explore medication knowledge and self-management practices of people with type 2 diabetes. Design: A one-shot cross sectional study using in-depth interviews and participant observation. Setting: Diabetes outpatient education centre of a university teaching hospital. Subjects: People with type 2 diabetes, n=30, 17 males and 13 females, age range 33-84, from a range of ethnic groups. Outcome measures: Ability to state name, main actions and when to take medicines. Performance of specific medication-related tasks; opening bottles and packs, breaking tablets in half, administering insulin, and testing blood glucose. Results: Average medication use >/=10years. Respondents were taking 86 different medicines, mean 7+/-2.97 SD. Dose frequency included two, three and four times per day. All respondents had >/=2 diabetic complications +/- other comorbidities. The majority (93%) were informed about how and when to take their medicines, but only 37% were given information about side effects and 17% were given all possible seven items of information. Younger respondents received more information than older respondents. Older respondents had difficulty opening bottles and breaking tablets in half. Twenty percent regularly forgot to take their medicines. Increasing medication costs was one reason for stopping medicines or reducing the dose or dose interval. The majority tested their blood glucose but did not control test their

meters and 33% placed used sharps directly into the rubbish. Conclusion: Polypharmacy was common. Medication knowledge and self-management were inadequate and could lead to adverse events.

REF ID: 365

Level III: Quasi-experimental study

Topic 4.1: Management-General

Dunstan, D. W., Daly, R. M., Owen, N., Jolley, D., De Courten, M., & Shaw, J. et al. (2002). High-intensity resistance training improves glycemic control in older patients with type 2 diabetes. ***Diabetes Care, 25*****(10), 1729-1736.**

Clinical Trial. Controlled Clinical Trial. Journal Article

OBJECTIVE: To examine the effect of high-intensity progressive resistance training combined with moderate weight loss on glycemic control and body composition in older patients with type 2 diabetes. RESEARCH DESIGN AND METHODS: Sedentary, overweight men and women with type 2 diabetes, aged 60-80 years (n = 36), were randomized to high-intensity progressive resistance training plus moderate weight loss (RT & WL group) or moderate weight loss plus a control program (WL group). Clinical and laboratory measurements were assessed at 0, 3, and 6 months. RESULTS: HbA(1c) fell significantly more in RT & WL than WL at 3 months (0.6 +/- 0.7 vs. 0.07 +/- 0.8%, P < 0.05) and 6 months (1.2 +/- 1.0 vs. 0.4 +/- 0.8%, P < 0.05). Similar reductions in body weight (RT & WL 2.5 +/- 2.9 vs. WL 3.1 +/- 2.1 kg) and fat mass (RT & WL 2.4 +/- 2.7 vs. WL 2.7 +/- 2.5 kg) were observed after 6 months. In contrast, lean body mass (LBM) increased in the RT & WL group (0.5 +/- 1.1 kg) and decreased in the WL group (0.4 +/- 1.0) after 6 months (P < 0.05). There were no between-group differences for fasting glucose, insulin, serum lipids and lipoproteins, or resting blood pressure. CONCLUSIONS: High-intensity progressive resistance training, in combination with moderate weight loss, was effective in improving glycemic control in older patients with type 2 diabetes. Additional benefits of improved muscular strength and LBM identify high-intensity resistance training as a feasible and effective component in the management program for older patients with type 2 diabetes.

REF ID: 332

Level I: Systematic Reviews

Topic 4.1: Management-General

Farmer, A., Montori, V., Dinneen, S., & Clar, C. (2006). Fish oil in people with type 2 diabetes mellitus. ***The Cochrane Library,*** **(1)**

Journal Article, Research, Systematic Review

A substantive amendment to this systematic review was last made on 30 May 2001. Cochrane reviews are regularly checked and updated if necessary. Background: People with type 2 diabetes mellitus are at increased risk from cardiovascular disease. Dietary fish oils are known to reduce triglyceride levels, but their impact on cholesterol levels, glycemic control and vascular outcomes are not well known. Objectives: To determine the effects of fish oil supplementation on cardiovascular outcomes, cholesterol levels and glycemic control in people with type 2 diabetes mellitus. Search strategy: We carried out a comprehensive search of the Cochrane Controlled Trials Register, Medline, Embase, Lilacs, bibliographies of relevant papers and contacted experts for identifying additional trials. Date of last search: September 2000. Selection criteria: All randomized placebo-controlled trials in which fish oil supplementation was the only intervention in people with type 2 diabetes were included. Authors were contacted for missing information. Data collection and analysis: Three investigators performed data extraction and quality scoring independently with discrepancies resolved by consensus. Main results: Eighteen trials including 823 participants followed for a mean of 12 weeks were included. Doses of fish oil used ranged from 3 to 18 g/day. No trials with vascular event or mortality endpoints were identified. The outcomes studied were glycemic control and lipid levels. Meta-analysis of pooled data demonstrated a statistically significant effect of fish oil in lowering triglycerides by 0.56 mmol/l (95% CI -0.71 to -0.40 mmol/l) and raising LDL cholesterol by 0.21 mmol/l (95% CI 0.02 to 0.41 mmol/l). No statistically significant effect was observed for fasting glucose, HbA1c, total or HDL cholesterol. The triglyceride lowering effect and the elevation in LDL cholesterol were most marked in those trials that recruited people with hypertriglyceridemia and used higher doses of fish oil. No adverse effects of the intervention were reported. Authors' conclusions: Fish oil supplementation in type 2 diabetes lowers triglycerides, may raise LDL cholesterol (especially in

hypertriglyceridemic patients on higher doses of fish oil) and has no statistically significant effect on glycemic control. Trials with vascular event or mortality defined endpoints are needed. [CINAHL Note: The Cochrane Collaboration systematic reviews contain interactive software that allows various calculations in the MetaView.]

REF ID: 389

Level II: Individual experimental study

Topic 1: Risks

Topic 2: Prevention

Gaede, P., Vedel, P., Larsen, N., Jensen, G. V., Parving, H. H., & Pedersen, O. (2003). Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. ***The New England Journal of Medicine, 348*****(5), 383-393.**

Clinical Trial; Journal Article; Randomized Controlled Trial; AIM; IM

BACKGROUND: Cardiovascular morbidity is a major burden in patients with type 2 diabetes. In the Steno-2 Study, we compared the effect of a targeted, intensified, multifactorial intervention with that of conventional treatment on modifiable risk factors for cardiovascular disease in patients with type 2 diabetes and microalbuminuria. METHODS: The primary end point of this open, parallel trial was a composite of death from cardiovascular causes, nonfatal myocardial infarction, nonfatal stroke, revascularization, and amputation. Eighty patients were randomly assigned to receive conventional treatment in accordance with national guidelines and 80 to receive intensive treatment, with a stepwise implementation of behavior modification and pharmacologic therapy that targeted hyperglycemia, hypertension, dyslipidemia, and microalbuminuria, along with secondary prevention of cardiovascular disease with aspirin. RESULTS: The mean age of the patients was 55.1 years, and the mean follow-up was 7.8 years. The decline in glycosylated hemoglobin values, systolic and diastolic blood pressure, serum cholesterol and triglyceride levels measured after an overnight fast, and urinary albumin excretion rate were all significantly greater in the intensive-therapy group than in the conventional-therapy group. Patients receiving intensive therapy also had a significantly lower risk of cardiovascular disease (hazard ratio, 0.47; 95 percent confidence interval, 0.24 to 0.73), nephropathy (hazard ratio, 0.39; 95 percent confidence interval, 0.17 to 0.87), retinopathy (hazard ratio, 0.42; 95 percent confidence interval, 0.21 to 0.86), and autonomic neuropathy (hazard ratio, 0.37; 95 percent confidence interval, 0.18 to 0.79). CONCLUSIONS: A target-driven, long-term, intensified intervention aimed at multiple risk factors in patients with type 2 diabetes and microalbuminuria reduces the risk of cardiovascular and microvascular events by about 50 percent.

REF ID: 358

Level IV: Non-experimental study

Topic 1: Risks

Gallo, J. J., Bogner, H. R., Morales, K. H., Post, E. P., Ten Have, T., & Bruce, M. L. (2005). Depression, cardiovascular disease, diabetes, and two-year mortality among older, primary-care patients. ***American Journal of Geriatric Psychiatry, 13*****(9), 748-755.**

Journal Article. Multicenter Study

OBJECTIVE: Depression is a major contributor to death and disability, but few follow-up studies of depression have been carried out in the primary-care setting. The authors sought to assess whether depression in older patients is associated with increased mortality after a 2-year follow-up interval and to estimate the population-attributable fraction (PAF) of depression on mortality in older primary-care patients. METHODS: Longitudinal cohort analysis was carried out in 20 primary-care practices. Participants were identified though a two-stage, age-stratified (60-74 or 75+) depression screening of randomly sampled patients; enrollment included patients who screened positive and a random sample of screened-negative patients. In all, 1,226 persons were assessed at baseline. Vital status at 2 years was the outcome of interest. RESULTS: Of 1,226 persons in the sample, 598 were classified as depressed. After 2 years, 64 persons had died. Persons with depression at baseline were more likely to die at the end of the 2-year follow-up interval than were persons without depression, even after accounting for potentially influential covariates such as whether the participant reported a history of myocardial infarction (MI) or diabetes. CONCLUSIONS: Among older, primary-care patients over the course of a 2-year follow-up interval, depression contributed as much to mortality as did MI or diabetes.

REF ID: 362

Level I: Systematic Reviews

Topic 4.3: Management-Medication

Garber, A., Marre, M., Blonde, L., Allavoine, T., Howlett, H., & Lehert, P. et al. (2003). Influence of initial hyperglycaemia, weight and age on the blood glucose lowering efficacy and incidence of hypoglycaemic symptoms with a single-tablet metformin-glibenclamide therapy (glucovance) in type 2 diabetes. *Diabetes, Obesity & Metabolism, 5*(3), 171-179.

Journal Article. Meta-Analysis

AIM: To evaluate the efficacy and incidence of hypoglycaemic symptoms associated with fixed combinations of metformin and glibenclamide (glyburide in the USA) formulated within a single tablet (tablet strengths 250 mg/1.25 mg, 500 mg/2.5 mg and 500 mg/5 mg), in comparison with metformin 500 mg and glibenclamide 2.5-5 mg monotherapy, in clinically important patient subgroups within the type 2 diabetic population. METHODS: A total of 1856 patients from three randomized, double-blind, multicentre, parallel-group clinical trials were stratified at baseline according to HbA1C (or = 8%), age (or = 65 years) and body mass index (BMI; or = 28 kg/m2). The effects of study treatments on HbA1C and the incidence of hypoglycaemic symptoms were determined in each subgroup. RESULTS: The combination treatments were more effective than either monotherapy irrespective of baseline HbA1C, age or BMI in each trial. Antihyperglycaemic effects were greater in patients with HbA1C > or = 8% at baseline, especially with the combinations. The majority of hypoglycaemic symptoms with glibenclamide-containing treatments occurred in patients with HbA1C < 8% at baseline. Neither age nor BMI had a marked effect on the efficacy of the combination treatments, and there was no increase in hypoglycaemic symptoms in older patients. CONCLUSIONS: Single-tablet metformin-glibenclamide combination treatment is more effective than metformin or glibenclamide monotherapy, and is well tolerated in patients with hyperglycaemia inadequately controlled by diet and exercise or antidiabetic monotherapy, irrespective of their severity of hyperglycaemia at baseline, age or weight.

REF ID: 384

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Gavin JR, I.,II. (2001). Type 2 diabetes: New drugs -- optimal treatment strategies. *Consultant, 41*(4), 581-3, 587-9.

Journal Article, Tables/Charts

A number of drugs are now available to help manage type 2 diabetes. Used singly or in combination, these agents can be deployed selectively to act at the level of the pancreatic beta-cell defect, increase peripheral insulin sensitivity, reduce hepatic gluconeogenesis, or accomplish any combination of these effects. The insulin secretagogues, repaglinide and nategrinide, are effective agents for patients with mildly elevated fasting glucose levels, poor glycemic control, and postprandial hyperglycemia. The alpha-glucosidase inhibitors can also be useful when postprandial hyperglycemia is the major glycemic abnormality. The thiazolidinediones, rosightazone and pioglitazone-peripheral insulin sensitizers -- also improve endothelial function and may preserve beta-cell capacity; to date they have proved to be free from hepatic toxicity. Given the inability to sustain glycemic control with monotherapy, combination regimens should be more widely employed. Glyburide and metformin can be given in a fixed-dose combination tablet. Insulin aspart and lispro, 2 short-acting insulins, can be given immediately before meals; insulin glargine is a long-acting insulin with true basal properties.

REF ID: 372

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Gill, J. M., & DiPrinzio, M. J. (2004). The medical society of delaware's uniform clinical guidelines for diabetes: Did they have a positive impact on quality of diabetes care? *Delaware Medical Journal, 76*(3), 111-122.

Journal Article

BACKGROUND: In 2001, the Diabetes Physician Committee of the Medical Society of Delaware developed Uniform Clinical Guidelines (UCGs) for diabetes mellitus. These guidelines were intended to

provide a standard for the diabetes quality indicators that could be used by all providers and all major insurers in Delaware. The guidelines were sent to Delaware physicians in December 2001. This study examines whether implementation of the diabetes UCG had a positive impact on the quality of diabetes care in primary care offices. METHODS: A chart review was conducted for 258 diabetic patients of 28 primary care physicians in all three counties in Delaware. Quality of care was compared from the year prior to guideline implementation (2001) to the year after implementation (2002). Quality was determined by process measures, including receipt of recommended monitoring tests (glycosylated hemoglobin, blood pressure, lipids, microalbumin, foot exams, eye exams) and immunizations (influenza and pneumococcal), as well as by outcome measures, including adequate glycemic control, blood pressure control, and lipid control. RESULTS: There was no significant change in most quality indicators from the year before to the year after implementation of the UCG. The only improvements seen were in influenza immunizations and, to some extent, lipid and blood pressure control. However, none of these reached optimal levels, and for some process measures (microalbumin testing and eye exams) there was a decrease in adherence to guidelines. In a second analysis, physicians who used diabetes flow sheets had better quality of care for most measures, although these differences were relatively small and not consistent across all measures. CONCLUSIONS: The Medical Society of Delaware's Uniform Clinical Guidelines are intended to standardize care for diabetes and other conditions. While the guidelines may help to reduce unnecessary duplication and confusion caused by multiple guidelines, this study showed that they have not yet resulted in substantial improvements in quality of care for diabetes. Since the study does suggest that using flow sheets is associated with somewhat better care, it could be that quality will improve as more physicians incorporate these tools into their practices.

REF ID: 390

Level II: Individual experimental study

Topic 4.3: Management-Medication

Topic 4.2: Management-Behavior Therapy

Goudswaard, A. N., Stolk, R. P., Zuithoff, N. P., de Valk, H. W., & Rutten, G. E. (2004). Long-term effects of self-management education for patients with type 2 diabetes taking maximal oral hypoglycaemic therapy: A randomized trial in primary care. ***Diabetic Medicine : A Journal of the British Diabetic Association, 21*****(5), 491-496.**

Clinical Trial; Journal Article; Multicenter Study; Randomized Controlled Trial; IM

AIMS: Education is an essential part of the management of patients with Type 2 diabetes, but the long-term effects are unclear and not well investigated in primary care. METHODS: Fifty-four patients (39-75 years) treated with maximal dosages of oral hypoglycaemic agents, needing to start insulin (HbA(1c)> or = 7.0%), were randomly allocated to a 6-month educational programme by a diabetes nurse (DN group) or usual care (UC group). Main outcome measures were HbA(1c), number of patients with HbA(1c) < 7.0%, and number of patients treated with insulin 18 months after baseline. RESULTS: Six weeks after the intervention HbA(1c) levels had improved from 8.2 (1.1) to 7.2 (1.3) in the DN group, and from 8.8 (1.5) to 8.4 (1.7) in the UC group. Adjusted for baseline values, at 6 weeks HbA(1c) improved 0.7% (95% confidence interval 0.1, 1.4) more in DN than in UC. Of the patients in DN, 60% reached HbA(1c) < 7.0% compared with 17% in UC (P < 0.01). However, at 18 months there were no significant differences for HbA(1c), number of patients with HbA(1c) < 7.0%, or number treated with insulin. CONCLUSIONS: Education was effective in improving glycaemic control and in delaying the need for insulin therapy in patients treated with maximal oral hypoglycaemic therapy. The reduced effect after 1 year was probably due to the discontinuation of the educational programme. Short-term education should not be offered without regular reinforcements integrated into standard diabetes care.

REF ID: 350

Level IV: Non-experimental study

Topic 1: Risks

Topic 3: Assessment

Topic 4.3: Management-Medication

Grodstein, F., Chen, J., Wilson, R. S., & Manson, J. E. (2001). Type 2 diabetes and cognitive function in community-dwelling elderly women. ***Diabetes Care, 24*****(6), 1060-1065.**

Journal Article, Research, Tables/Charts

OBJECTIVE--To examine the relationship of type 2 diabetes to cognitive function in community-dwelling women. RESEARCH DESIGN AND METHODS--From 1995 to 1999, we administered four tests of cognitive function (Telephone Interview of Cognitive Status [TICS], immediate and delayed recall of the East Boston Memory Test, and verbal fluency) by telephone to 2,374 participants (70-78 years of age) of the Nurses' Health Study. Information on diabetes was collected biennially beginning in 1976; 82 women reported type 2 diabetes before their cognitive testing. We used linear and logistic regression models to calculate multivariate-adjusted mean differences in scores and relative risks of a low score (bottom 10% of the distribution) for diabetic women compared with nondiabetic women. RESULTS--After multivariate adjustment, women with type 2 diabetes scored lower on all our cognitive tests than women without diabetes. On the general test of cognition (TICS), the mean difference in score between women with and without diabetes was -0.60 (95% CI -1.18 to -0.03, P = 0.04) and the relative risk of a low TICS score was 1.98 (95% CI 1.06 to 3.69). On a global score combining results of the four tests, the mean for diabetic women was lower than that among women without diabetes (adjusted difference in score -0.73, 95% CI -1.42 to -0.04, P = 0.04), and the relative risk of a low global score was 2.16 (95% CI 1.10 to 4.21). Relative to women without diabetes, longer duration of diabetes was associated with lower scores. Few diabetic women were pharmacologically treated (n = 31), but those taking medication had scores similar to those of women without diabetes. CONCLUSIONS--In these women, diabetes was related to lower scores on several aspects of cognitive function. Longer duration of diabetes may be associated with poorer scores, but hypoglycemic therapy may ameliorate scores.

REF ID: 370

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Guthrie, B., Love, T., Fahey, T., Morris, A., & Sullivan, F. (2005). Control, compare and communicate: Designing control charts to summarise efficiently data from multiple quality indicators. ***Quality & Safety in Health Care, 14*****(6), 450-454.**

Journal Article

Summarising the complex data generated by multiple cross sectional quality indicators in a way that patients, clinicians, managers and policymakers find useful is challenging. A common approach is aggregation to create summary measures such as star ratings and balanced score cards, but these may conceal the detail needed to focus quality improvement. We propose an alternative way of summarising and presenting multiple quality indicators, suitable for use for quality improvement and governance. This paper discusses (1) control charts for repeated measurements of single processes as used in industrial statistical process control (SPC); (2) control charts for cross sectional comparison of many institutions for a single quality indicator (rarely used in industry but commonly proposed for health care); and (3) small multiple graphics which combine control chart signal extraction with efficient graphical presentations for multiple indicators.

REF ID: 364

Level III: Quasi-experimental study

Topic 4.3: Management-Medication

Harada, K., Ohmori, M., & Fujimura, A. (2002). Vasoconstricting effect of angiotensin II in human hand veins: Influence of aging, diabetes mellitus and hypertension. ***Hypertension Research - Clinical & Experimental, 25*****(5), 683-688.**

Clinical Trial. Controlled Clinical Trial. Journal Article

We examined human hand veins to determine whether venoconstricting response to angiotensin II (Ang II) and noradrenaline (NA) was influenced by aging or such diseases as diabetes mellitus (DM) and hypertension (HT). Twenty healthy male subjects (20-73 years), and 8 male patients with non-insulin-dependent DM and 8 male patients with essential HT were included in this study. A constant dose (50 ng/min) of Ang II or increasing dose (2-256 ng/min) of NA was infused into the dorsal hand vein and its diameter was measured using a linear variable differential transformer. The constant infusion of Ang II caused rapid desensitization or tachyphylaxis. The venoconstriction by Ang II in the 8 elderly subjects (58 to 73 years) was significantly ($p<0.05$) larger than that in the 8 young subjects (20 to 36 years) from 6 to 18

min after the start of the infusion (after 6 min: 63.6+/-11.6 (mean+/-SD)% vs. 39.9+/-20.8%, 12 min: 34.0+/-11.9% vs. 12.0+/-12.0%). However, the venoconstriction by Ang II in the patients with DM or HT was not significantly different from that in the 9 age-matched control subjects. No significant difference in venoconstrictor response to NA was observed between the young and elderly subjects, nor between the control subjects and the patients with DM or HT. These findings indicated that venoconstrictor response to Ang II might be greater in the elderly but might not be influenced by DM nor HT.

REF ID: 379

QM: Quality Measures

Topic 5: Evaluation/Follow-up

HillBriggs, F., Gary, T. L., BaptisteRoberts, K., & Brancati, F. L. (2005). Thirty-six-item short-form outcomes following a randomized controlled trial in type 2 diabetes. *Diabetes Care, 28*(2), 443-444. Journal Article, Research, Tables/Charts

REF ID: 373

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Hosler, A. S., Godley, K., & Rowland, D. H. (2002). An initiative to improve diabetes care standards in healthcare organizations serving minorities. *Diabetes Educator, 28*(4), 581-589. Evaluation Studies. Journal Article

PURPOSE: This study was designed to assess changes of diabetes care standards in healthcare organizations that participated in 2-year initiative to improve diabetes care and expand outreach in minority communities. METHODS: An independent sample of the medical records of adults with type 2 diabetes was randomly drawn at 3 points of time (N = 829). Rates of compliance with 20 selected measures of standards of basic diabetes care were measured and compared over time. RESULTS: Significant improvements in compliance rates from baseline to the end point were found in 11 measures including annual hemoglobin A1C testing (65.8% to 76.3%), annual lipid profile (33.8% to 49.1%), and biannual lower extremity examination (40.0% to 56.3%). CONCLUSIONS: Improvements in diabetes care were credited with giving providers feedback on their compliance and increasing support of patient self-care, especially through tailoring outreach and services to minorities.

REF ID: 368

Level IV: Non-experimental study

Topic 1: Risks

Isomaa, B., Almgren, P., Tuomi, T., Forsen, B., Lahti, K., & Nissen, M. et al. (2001). Cardiovascular morbidity and mortality associated with the metabolic syndrome. *Diabetes Care, 24*(4), 683-689. Journal Article. Multicenter Study

OBJECTIVE: To estimate the prevalence of and the cardiovascular risk associated with the metabolic syndrome using the new definition proposed by the World Health Organization RESEARCH DESIGN AND METHODS: A total of 4,483 subjects aged 35-70 years participating in a large family study of type 2 diabetes in Finland and Sweden (the Botnia study) were included in the analysis of cardiovascular risk associated with the metabolic syndrome. In subjects who had type 2 diabetes (n = 1,697), impaired fasting glucose (IFG)/impaired glucose tolerance (IGT) (n = 798) or insulin-resistance with normal glucose tolerance (NGT) (n = 1,988), the metabolic syndrome was defined as presence of at least two of the following risk factors: obesity, hypertension, dyslipidemia, or microalbuminuria. Cardiovascular mortality was assessed in 3,606 subjects with a median follow-up of 6.9 years. RESULTS: In women and men, respectively, the metabolic syndrome was seen in 10 and 15% of subjects with NGT, 42 and 64% of those with IFG/IGT, and 78 and 84% of those with type 2 diabetes. The risk for coronary heart disease and stroke was increased threefold in subjects with the syndrome ($P < 0.001$). Cardiovascular mortality was markedly increased in subjects with the metabolic syndrome (12.0 vs. 2.2%, $P < 0.001$). Of the individual components of the metabolic syndrome, microalbuminuria conferred the strongest risk of cardiovascular death (RR 2.80; $P = 0.002$). CONCLUSIONS: The WHO definition of the metabolic syndrome identifies subjects with increased cardiovascular morbidity and mortality and offers a tool for comparison of results from diferent studies.

REF ID: 376

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Jones, D., Hendricks, A., Comstock, C., Rosen, A., Chang, B. H., & Rothendler, J. et al. (2000). Eye examinations for VA patients with diabetes: Standardizing performance measures. ***International Journal for Quality in Health Care, 12*****(2), 97-104.**

Journal Article

OBJECTIVE: To demonstrate the potential of the Health Plan Employer Data and Information Set (HEDIS) for the calculation of a performance measure for eye exams in the diabetic population using Veterans Health Administration (VA) administrative data. DESIGN: We calculated a 1-year HEDIS-defined patient denominator and three alternative denominators that considered coding factors in identifying a VA patient as diabetic. We calculated the HEDIS-defined numerator, along with alternative specifications that captured other types of eye exams. Finally, we supplemented national data with VA pharmacy and Medicare claims data to identify all VA diabetic patients at 14 selected VA facilities and to establish a more accurate picture of non-VA health care utilization. RESULTS: The national average annual HEDIS-defined eye exam rate in the VA was 26% in fiscal 1997 compared with 39% for managed care organizations. Medicare utilization raised this by 15 percentage points at 14 northeastern VA hospitals. Over 2 years, at least two-thirds of diabetic VA patients had some type of eye exam through VA or Medicare. CONCLUSION: A HEDIS measure of eye exams for VA patients with diabetes can be calculated using VA administrative data only. However, the question remains to what extent the denominator and numerator accurately and completely identify all diabetic patients using VA services and all appropriate eye exams. We recommend caution in interpreting the results of performance measurement across different health care sectors based on what we currently know are data system limitations.

REF ID: 375

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Keyes, M. A. (2000). CONQUEST 2.0: An emerging clinical performance measurement tool. ***Journal for Healthcare Quality, 22*****(3), 29-36.**

Journal Article

Variations in quality of healthcare have existed for many years, yet interest in measuring, understanding, and eliminating these variations has waxed and waned. The advent of managed care and its perceived focus on reducing costs has stimulated interest in variations in quality of care. In response to the need to better understand and measure quality, the Agency for Health Care Policy and Research (AHCPR) funded the development of a tool capable of categorizing clinical performance measures, a subset of quality measures, for comparing and evaluating them relative to a user's specific needs for measuring and improving quality. This research lead to the development of the COmputerized Needs-oriented QUality measurement Evaluation SysTem (CONQUEST)--a free software quality improvement tool that includes about 1,200 clinical performance measures. CONQUEST enables users to quickly identify measures of interest, compare them on the basis of factors of importance, and select measures that will help them measure and improve care.

REF ID: 371

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Kirk, J. K., Bell, R. A., Bertoni, A. G., Arcury, T. A., Quandt, S. A., & Goff, D. C.,Jr et al. (2005). Ethnic disparities: Control of glycemia, blood pressure, and LDL cholesterol among US adults with type 2 diabetes. ***Annals of Pharmacotherapy, 39*****(9), 1489-1501.**

Journal Article

OBJECTIVE: To examine ethnic disparities in the quality of diabetes care among adults with diabetes in the US through a systematic qualitative review. DATA SOURCES: Material published in the English language was searched from 1993 through June 2003 using PubMed, Web of Science, Cumulative Index to Nursing and Allied Health, the Cochrane Library, Combined Health Information Database, and Education Resources Information Center. STUDY SELECTION AND DATA EXTRACTION: Studies of patients

with diabetes in which at least 50% of study participants were ethnic minorities and studies that made ethnic group comparisons were eligible. Research on individuals having prediabetes, those <18 years of age, or women with gestational diabetes were excluded. Reviewers used a reproducible search strategy. A standardized abstraction and grading of articles for publication source and content were used. Data on glycemia, blood pressure, and low-density lipoprotein cholesterol (LDL-C) were extracted in patients with diabetes. A total of 390 studies were reviewed, with 78 meeting inclusion criteria. DATA SYNTHESIS: Ethnic minorities had poorer outcomes of care than non-Hispanic whites. These disparities were most pronounced for glycemic control and least evident for LDL-C control. Most studies showed blood pressure to be poorly controlled among ethnic minorities. CONCLUSIONS: Control of risk factors for diabetes (glycemia, blood pressure, LDL-C) is challenging and requires routine assessment. These findings indicate that additional efforts are needed to promote diabetes quality of care among minority populations.

REF ID: 345

Level V: Case report

Topic 3: Assessment

Kolbasovsky, A. (2004). Anger and mental health in type 2 diabetes. *Diabetes Primary Care, 6*(1), 44, 46-8.

Journal Article, Research, Tables/Charts

Previous qualitative studies have identified anger as an important issue for people with diabetes yet few quantitative studies have addressed this topic. In this study, participants with type 2 diabetes had greater anger than participants without diabetes. There was a significant association between diabetes status and anger ($p < 0.01$). Our findings suggest that members of the diabetes treatment team need to assess and address issues of anger, which may affect the physical as well as the mental health of people with diabetes.

REF ID: 346

Level IV: Non-experimental study

Topic 4.1: Management-General

Topic 2: Prevention

Koro, C. E., Bowlin, S. J., Bourgeois, N., & Fedder, D. O. (2004). Glycemic control from 1988 to 2000 among U.S. adults diagnosed with type 2 diabetes: A preliminary report. *Diabetes Care, 27*(1), 17-20.

Journal Article, Research, Tables/Charts

OBJECTIVE: To describe the changes in demographics, antidiabetic treatment, and glycemic control among the prevalent U.S. adult diagnosed type 2 diabetes population between the National Health and Nutrition Examination Survey (NHANES) III (1988-1994) and the initial release of NHANES 1999-2000. RESEARCH DESIGN AND METHODS: The study population was derived from NHANES III (n = 1,215) and NHANES 1999-2000 (n = 372) subjects who reported a diagnosis of type 2 diabetes with available data on diabetes medication and HbA(1c). Four therapeutic regimens were defined: diet only, insulin only, oral antidiabetic drugs (OADs) only, or OADs plus insulin. Multiple logistic regression was used to examine changes in antidiabetic regimens and glycemic control rates over time, adjusted for demographic and clinical risk factors. The outcome measure for glycemic control was HbA(1c). Glycemic control rates were defined as the proportion of type 2 diabetic patients with HbA(1c) level <7%. RESULTS: Dietary treatment in individuals with diabetes decreased as the sole therapy from 27.4 to 20.2% between the surveys. Insulin use also decreased from 24.2 to 16.4%, while those on OADs only increased from 45.4 to 52.5%. Combination of OADs and insulin increased from 3.1 to 11.0%. Glycemic control rates declined from 44.5% in NHANES III (1988-1994) to 35.8% in NHANES 1999-2000. CONCLUSIONS: Treatment regimens among U.S. adults diagnosed with type 2 diabetes have changed substantially over the past 10 years. However, a decrease in glycemic control rates was also observed during this time period. This trend may contribute to increased rates of macrovascular and microvascular diabetic complications, which may impact health care costs. Our data support the public health message of implementation of early, aggressive management of diabetes.

REF ID: 366

Level IV: Non-experimental study

Topic 1: Risks

Lawlor, D. A., Davey Smith, G., & Ebrahim, S. (2002). Birth weight of offspring and insulin

resistance in late adulthood: Cross sectional survey. ***BMJ, 325*****(7360), 359.**

Journal Article. Multicenter Study

OBJECTIVE: To investigate the association between birth weight of offspring and mothers' insulin resistance in late adulthood. DESIGN: Cross sectional survey. SETTING: General practitioner's surgeries in 23 towns in Great Britain. PARTICIPANTS: 4286 women aged 60-79 years. MAIN OUTCOME MEASURES: Maternal insulin resistance. RESULTS: Birth weight of offspring was inversely related to maternal insulin resistance in late adulthood. For each 1 kg higher birth weight of offspring, women had a 15% reduction in the odds of being in the fourth with highest insulin resistance, compared to other fourths (odds ratio 0.85; 95% confidence interval 0.71 to 1.00). This increased to 27% (0.73; 0.60 to 0.90) after adjusting data for potential confounders. A U shaped relation between birth weight of offspring and diabetes in older age was found; women with the lightest and heaviest offspring had the highest prevalence of diabetes. CONCLUSIONS: Birth weight of offspring is inversely related to the mother's insulin resistance in late adulthood, despite the association of glucose intolerance during pregnancy with heavier offspring at birth. Common genetic factors contribute to the relation between birth weight and risk of cardiovascular disease and diabetes in adults.

REF ID: 378

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Leichter, S. B. (2005). The business of diabetes. making outpatient care of diabetes more efficient: Analyzing noncompliance. ***Clinical Diabetes, 23*****(4), 187-190.**

Journal Article, Tables/Charts

REF ID: 330

Level IV: Non-experimental study

Topic 1: Risks

Lu, H. K., & Yang, P. C. (2004). Cross-sectional analysis of different variables of patients with non-insulin dependent diabetes and their periodontal status. ***International Journal of Periodontics & Restorative Dentistry, 24*****(1), 70-79.**

Journal Article, Research, Tables/Charts

The periodontal condition of 72 non-insulin dependent diabetes patients was compared with that of 92 nondiabetic individuals. Plaque Index (PII), Calculus Index (CI), Gingival Index (GI), and attachment loss (AL) were measured on four surfaces of six teeth in each subject. All four parameters were significantly higher in the diabetic group. No significant difference in the frequency of toothbrushing was found between the groups. For all age groups, GI and AL were higher in the diabetic group. In each group, GI was not changed with age, while AL increased with age. Classification of the groups based on PII showed that the diabetic group's GI was higher than the nondiabetic group for low, medium, or high PII values. The diabetic group showed higher AL for only the medium and high PII groups. Classification by CI revealed that the diabetic group's GI and AL were significantly higher than those of the nondiabetic group for subjects with low, medium, or high values of CI. Multiple regression analysis revealed that the main factor affecting GI was the presence or absence of diabetes. PII and CI both showed a significant relationship with GI; age was the second most significant factor. The most significant factors influencing AL were CI and the presence or absence of diabetes; age was the second most significant factor. Patients who had had diabetes for more than 10 years had a higher AL than those who had suffered from diabetes for less than 10 years. Patients with average HbA1c values > or = 10% had more serious mean GI values than those with HbA1c values < 10%. In patients with diabetes, age, plaque accumulation, and calculus formation have more detrimental effects on the periodontal apparatus than in healthy individuals.

REF ID: 335

Level IV: Non-experimental study

Topic 1: Risks

Magata, Y., Oba, K., Inuzuka, Y., & Nakano, H. (2005). Aging per se does not influence postprandial glucose levels in type 2 diabetes. ***Geriatrics and Gerontology International, 5*****(3), 146-151.**

Journal Article, Research, Tables/Charts

Abstract not available

REF ID: 347

Level IV: Non-experimental study

Topic 3: Assessment

Meigs, J. B., Muller, D. C., Nathan, D. M., Blake, D. R., & Andres, R. (2003). The natural history of progression from normal glucose tolerance to type 2 diabetes in the baltimore longitudinal study of aging. *Diabetes, 52*(6), 1475-1484.

Journal Article, Research, Tables/Charts

The natural history of progression from normal glucose tolerance (NGT) to impaired fasting glucose (IFG), impaired glucose tolerance (IGT), and type 2 diabetes is not well defined. We studied this progression using biennial oral glucose tolerance tests performed in the Baltimore Longitudinal Study of Aging and survival analysis to assess progression from NGT to abnormal fasting plasma glucose (FPG; > or =6.1 mmol/l), abnormal 2-h plasma glucose (2hPG; > or =7.8 mmol/l), IFG (FPG 6.1-6.9 mmol/l, 2hPG or =7.0 mmol/l or 2hPG > or =11.1 mmol/l). At baseline, the 815 subjects had a mean age of 57 years, 35% were women, and 60% had NGT. Of the 488 subjects with NGT, over half were followed for at least 10 years. By 10 years, 14% had progressed to abnormal FPG and 48% to abnormal 2hPG. Of the 267 subjects who progressed to IFG-IGT, 216 had additional follow-up. By 10 years, 8% of these progressed to diabetes by FPG whereas 27% progressed by 2hPG. In subsidiary analyses, we defined "abnormal" FPG as > or =5.55 mmol/l and "diabetic" FPG as > or =6.1 mmol/l, making the baseline prevalence of IFG similar to that of IGT. By these criteria, 43% progressed to abnormal FPG and 43% to abnormal 2hPG by 10 years of follow-up; among subjects developing impaired FPG or 2hPG, 22% progressed to diabetes by FPG whereas 17% progressed by 2hPG at 10 years. Nonetheless, 42% of subjects developing abnormal FPG did not develop abnormal 2hPG, and vice versa. We conclude that, although phenotypic differences in rates of progression are partly a function of diagnostic thresholds, fasting and postchallenge hyperglycemia may represent phenotypes with distinct natural histories in the evolution of type 2 diabetes.

REF ID: 334

Level IV: Non-experimental study

Topic 3: Assessment

Meneilly, G. S., & Elahi, D. (2005). Metabolic alterations in middle-aged and elderly lean patients with type 2 diabetes. *Diabetes Care, 28*(6), 1498-1499.

Journal Article, Research, Tables/Charts

No abstract available.

REF ID: 348

Level IV: Non-experimental study

Topic 1: Risks

Michels, K. B., Solomon, C. G., Hu, F. B., Rosner, Hankinson, S. E., & Colditz, G. A. et al. (2003). Type 2 diabetes and subsequent incidence of breast cancer in the nurses' health study. *Diabetes Care, 26*(6), 1752-1758.

Journal Article, Research, Tables/Charts

OBJECTIVE: Hyperinsulinemia may promote mammary carcinogenesis. Insulin resistance has been linked to an increased risk of breast cancer and is also characteristic of type 2 diabetes. We prospectively evaluated the association between type 2 diabetes and invasive breast cancer incidence in the Nurses' Health Study. RESEARCH DESIGN AND METHODS: A total of 116,488 female nurses who were 30-55 years old and free of cancer in 1976 were followed through 1996 for the occurrence of type 2 diabetes and through 1998 for incident invasive breast cancer, verified by medical records and pathology reports. RESULTS: During 2.3 million person-years of follow-up, we identified 6,220 women with type 2 diabetes and 5,189 incident cases of invasive breast cancer. Women with type 2 diabetes had a modestly elevated incidence of breast cancer (hazard ratio [HR] = 1.17; 95% CI 1.01-1.35) compared with women without diabetes, independent of age, obesity, family history of breast cancer, history of benign breast disease, reproductive factors, physical activity, and alcohol consumption. This association was apparent among postmenopausal women (1.16; 0.98-1.62) but not premenopausal women (0.83; 0.48-1.42). The association was predominant among women with estrogen receptor-positive breast cancer (1.22; 1.01-1.47). CONCLUSIONS: Women with type 2 diabetes may have a slightly increased risk of breast cancer.

REF ID: 342

Level IV: Non-experimental study

Topic 1: Risks

Nichols, G. A., Gullion, C. M., Koro, C. E., Ephross, S. A., & Brown, J. B. (2004). The incidence of congestive heart failure in type 2 diabetes: An update. *Diabetes Care, 27*(8), 1879-1884.

Journal Article, Research, Tables/Charts

OBJECTIVE: The aims of this study were to update previous estimates of the congestive heart failure (CHF) incidence rate in patients with type 2 diabetes, compare it with an age- and sex-matched nondiabetic group, and describe risk factors for developing CHF in diabetic patients over 6 years of follow-up. RESEARCH DESIGN AND METHODS: We performed a retrospective cohort study of 8,231 patients with type 2 diabetes and 8,845 nondiabetic patients of similar age and sex who did not have CHF as of 1 January 1997, following them for up to 72 months to estimate the CHF incidence rate. In the diabetic cohort, we constructed a Cox regression model to identify risk factors for CHF development. RESULTS: Patients with diabetes were much more likely to develop CHF than patients without diabetes (incidence rate 30.9 vs. 12.4 cases per 1,000 person-years, rate ratio 2.5, 95% CI 2.3-2.7). The difference in CHF development rates between persons with and without diabetes was much greater in younger age-groups. In addition to age and ischemic heart disease, poorer glycemic control (hazard ratio 1.32 per percentage point of HbA(1c)) and greater BMI (1.12 per 2.5 units of BMI) were important predictors of CHF development. CONCLUSIONS: The CHF incidence rate in type 2 diabetes may be much greater than previously believed. Our multivariate results emphasize the importance of controlling modifiable risk factors for CHF, namely hyperglycemia, elevated blood pressure, and obesity. Younger patients may benefit most from risk factor modification.

REF ID: 349

Level I: Systematic Reviews

Topic 4.2: Management-Behavior Therapy

Norris, S. L., Lau, J., Smith, S. J., Schmid, C. H., & Engelgau, M. M. (2002). Self-management education for adults with type 2 diabetes: A meta-analysis of the effect on glycemic control. *Diabetes Care, 25*(7), 1159-1171.

Journal Article, Research, Systematic Review, Tables/Charts

OBJECTIVE-To evaluate the efficacy of self-management education on GHb in adults with type 2 diabetes. RESEARCH DESIGN AND METHODS-We searched for English language trials in Medline (1980-1999), Cinahl (1982-1999), and the Educational Resources Information Center database (ERIC) (1980-1999), and we manually searched review articles, journals with highest topic relevance, and reference lists of included articles. Studies were included if they were randomized controlled trials that were published in the English language, tested the effect of self-management education on adults with type 2 diabetes, and reported extractable data on the effect of treatment on GHb. A total of 31 studies of 463 initially identified articles met selection criteria. We computed net change in GHb, stratified by follow-up interval, tested for trial heterogeneity, and calculated pooled effects sizes using random effects models. We examined the effect of baseline GHb, follow-up interval, and intervention characteristics on GHb. RESULTS-On average, the intervention decreased GHb by 0.76% (95% CI 0.34-1.18) more than the control group at immediate follow-up; by 0.26% (0.21% increase - 0.73% decrease) at 1-3 months of follow-up; and by 0.26% (0.05-0.48) at >/=4 months of follow-up. GHb decreased more with additional contact time between participant and educator; a decrease of 1% was noted for every additional 23.6 h (13.3-105.4) of contact. CONCLUSIONS-Self-management education improves GHb levels at immediate follow-up, and increased contact time increases the effect. The benefit declines 1-3 months after the intervention ceases, however, suggesting that learned behaviors change over time. Further research is needed to develop interventions effective in maintaining long-term glycemic control.

REF ID: 374

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Parchman, M. L., Burge, S. K., & Residency Research Network of South Texas,Investigators. (2002). Continuity and quality of care in type 2 diabetes: A residency research network of south texas study.

Journal of Family Practice, 51(7), 619-624.

Journal Article. Multicenter Study

OBJECTIVE: We investigated the relationship between continuity of care and the quality of care received by patients with type 2 diabetes mellitus. STUDY DESIGN: We used a cross-sectional patient survey and medical record review. POPULATION: Consecutive patients with an established diagnosis of type 2 diabetes mellitus presented to 1 of 6 clinics within the Residency Research Network of South Texas, a network of 6 family practice residencies affiliated with the University of Texas Health Science Center at San Antonio. OUTCOMES MEASURED: Continuity was measured as the proportion of visits within the past year to the patient's usual primary care provider. A quality of care score was computed based on the American Diabetes Association's Provider Recognition Program criteria from data collected through medical record review and patient surveys. Each patient was awarded points based on the presence or absence of each criterion. RESULTS: The continuity score was associated significantly with the quality of care score in the anticipated direction (r =.15, P =.04). Patients who had seen their usual providers within the past year were significantly more likely to have had an eye examination, a foot examination, 2 blood pressure measurements, and a lipid analysis. CONCLUSIONS: Continuity of care is associated with the quality of care received by patients with type 2 diabetes mellitus. Continuity of care may influence provider and patient behaviors in ways that improve quality. Further research on how continuity contributes to improved quality is needed.

REF ID: 329

Level I: Systematic Reviews

Topic 2: Prevention

Pedersen, B. K., & Saltin, B. (2006). Evidence for prescribing exercise as therapy in chronic disease. ***Scandinavian Journal of Medicine & Science in Sports, 16*****(Supplement 1), 3-63.**

Journal Article, Research, Systematic Review, Tables/Charts

Considerable knowledge has accumulated in recent decades concerning the significance of physical activity in the treatment of a number of diseases, including diseases that do not primarily manifest as disorders of the locomotive apparatus. In this review we present the evidence for prescribing exercise therapy in the treatment of metabolic syndrome-related disorders (insulin resistance, type 2 diabetes, dyslipidemia, hypertension, obesity), heart and pulmonary diseases (chronic obstructive pulmonary disease, coronary heart disease, chronic heart failure, intermittent claudication), muscle, bone and joint diseases (osteoarthritis, rheumatoid arthritis, osteoporosis, fibromyalgia, chronic fatigue syndrome) and cancer, depression, asthma and type 1 diabetes. For each disease, we review the effect of exercise therapy on disease pathogenesis, on symptoms specific to the diagnosis, on physical fitness or strength and on quality of life. The possible mechanisms of action are briefly examined and the principles for prescribing exercise therapy are discussed, focusing on the type and amount of exercise and possible contraindications.

REF ID: 338

Level IV: Non-experimental study

Topic 3: Assessment

Penckofer, S., Filliung, D. R., & Labropoulos, N. (2005). Non-invasive cardiovascular risk assessment in women with type 2 diabetes. ***Journal of Vascular Nursing, 23*****(1), 2-9.**

Journal Article, CEU, Diagnostic Images, Exam Questions, Research, Tables/Charts

This study assessed and compared carotid intima-media thickness (IMT) in postmenopausal women with type 2 diabetes with that in postmenopausal women without type 2 diabetes and compared risk factors that contribute to increased carotid IMT in these groups of women. Carotid IMT, a non-invasive assessment of cardiovascular risk, was measured using high-resolution ultrasound in 20 postmenopausal women with type 2 diabetes and 20 postmenopausal women without type 2 diabetes who had no known coronary heart disease. Risk factors (age, race, family history, diabetes, hypertension, high cholesterol, years past menopause, use of hormone replacement therapy, perceived level of physical activity, and body mass index) known to contribute to coronary heart disease were also assessed. Mean carotid IMT was .88 mm for women with type 2 diabetes compared with .74 mm for women without type 2 diabetes. There were no differences between groups in age, race, cholesterol, and perceived level of physical activity. Women with type 2 diabetes, however, reported more hypertension (P = .004), greater body mass index (P = .026), and

less use of hormone replacement therapy (P = .027). Of concern is that 10% of the women with diabetes had stenosis that required surgical intervention. Findings suggest that carotid IMT is a valid way to screen for cardiovascular risk, particularly in postmenopausal women who are at high risk for coronary heart disease. It may also be a feasible, non-invasive method for the detection and prevention of the macrovascular complications of diabetes.

REF ID: 340

Level IV: Non-experimental study

Topic 1: Risks

Rana, J. S., Mittleman, Sheikh, J., Hu, F. B., Manson, J. E., & Colditz, G. A. et al. (2004). Chronic obstructive pulmonary disease, asthma, and risk of type 2 diabetes in women. *Diabetes Care, 27*(10), 2478-2484.

Journal Article, Research, Tables/Charts

OBJECTIVE: Inflammation plays a key role in chronic obstructive pulmonary disease (COPD) and asthma. Increasing evidence points toward a role of inflammation in the pathogenesis of type 2 diabetes. We wanted to determine the relation of COPD and asthma with the development of type 2 diabetes. RESEARCH DESIGN AND METHODS: The Nurses' Health Study is a prospective cohort study. From 1988-1996, 103,614 female nurses were asked biennially about a physician diagnosis of emphysema, chronic bronchitis, asthma, and diabetes. RESULTS: During 8 years of follow-up, we documented a total of 2,959 new cases of type 2 diabetes. The risk of type 2 diabetes was significantly higher for patients with COPD than those without (multivariate relative risk 1.8, 95% CI 1.1-2.8). By contrast, the risk of type 2 diabetes among asthmatic patients was not increased (1.0, 0.8-1.2). The asthma results remained nonsignificant even when we evaluated diabetes risk by duration of asthma exposure. CONCLUSIONS: Our findings suggest that COPD may be a risk factor for developing type 2 diabetes. Differences in the inflammation and cytokine profile between COPD and asthma might explain why COPD, but not asthma, is associated with increased risk of type 2 diabetes. Copyright 2004 American Diabetes Association

REF ID: 344

Level IV: Non-experimental study

Topic 1: Risks

Relimpio, F., MartinezBrocca, LealCerro, A., Losada, F., Mangas, & Pumar, A. et al. (2004). Variability in the presence of the metabolic syndrome in type 2 diabetic patients attending a diabetes clinic: Influences of age and gender. *Diabetes Research and Clinical Practice, 65*(2), 135-142.

Journal Article, Research, Tables/Charts

In this study, we have assessed age and gender-related influences on the presence of the metabolic syndrome (MS) and closely related variables in Type 2 diabetic patients attending a diabetes clinic. For this purpose, we have taken retrospective clinical and biochemical data from consecutive Type 2 diabetic patients (n = 291) and we have classified them by gender, age (with 55 and 70 years as cut-off levels) and having or not having the MS (using both the WHO and NCEP-ATP III MS definitions). A higher prevalence of adiposity and hypertension was present in the females. Males were characterized by higher uric acid and lower HDL-cholesterol and apoA(1) levels (two-way ANOVA considering jointly age and gender as main effects, $P < 0.05$ in every case). Overall the prevalence of NCEP-ATP III-defined MS was less frequent than WHO-defined MS (63.2% versus 81.1%, respectively). This difference was greater for males (42.1% versus 77.6%, respectively) than for females (75.5% versus 83.2% respectively). The kappa-coefficient for the concordance between both MS definitions was 0.46 for males and 0.72 for females in the first age band, 0.29 for males and 0.48 for females in the second age band and 0.24 for males and 0.51 for females in the third age band. Thus, this study reveals relevant differences in the application of WHO and NCEP-ATP III MS definitions in a clinic-based Type 2 diabetic population from Southern Spain. In addition, the data suggest that gender confers a specific influence upon some MS-associated features in Type 2 diabetic patients attending a diabetes clinic irrespective of age band.

REF ID: 357

Level I: Systematic Reviews

Topic 4.1: Management-General

Renders, C. M., Valk, G. D., Griffin, S., Wagner, E. H., Eijk JThM, , & Assendelft, W. J. J. (2006).

Interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings. ***Cochrane Database of Systematic Reviews, 2***

Background Diabetes is a common chronic disease that is increasingly managed in primary care. Different systems have been proposed to manage diabetes care. Objectives To assess the effects of different interventions, targeted at health professionals or the structure in which they deliver care, on the management of patients with diabetes in primary care, outpatient and community settings. Search strategy We searched the Cochrane Effective Practice and Organisation of Care Group specialised register, the Cochrane Controlled Trials Register (Issue 4 1999), MEDLINE (1966-1999), EMBASE (1980-1999), Cinahl (1982-1999), and reference lists of articles. Selection criteria Randomised trials (RCTs), controlled clinical trials (CCTs), controlled before and after studies (CBAs) and interrupted time series (ITS) analyses of professional, financial and organisational strategies aimed at improving care for people with Type 1 or Type 2 diabetes. The participants were health care professionals, including physicians, nurses and pharmacists. The outcomes included objectively measured health professional performance or patient outcomes, and self-report measures with known validity and reliability. Data collection and analysis Two reviewers independently extracted data and assessed study quality. Main results Forty-one studies were included involving more than 200 practices and 48,000 patients. Twenty-seven studies were RCTs, 12 were CBAs, and two were ITS. The studies were heterogeneous in terms of interventions, participants, settings and outcomes. The methodological quality of the studies was often poor. In all studies the intervention strategy was multifaceted. In 12 studies the interventions were targeted at health professionals, in nine they were targeted at the organisation of care, and 20 studies targeted both. In 15 studies patient education was added to the professional and organisational interventions. A combination of professional interventions improved process outcomes. The effect on patient outcomes remained less clear as these were rarely assessed. Arrangements for follow-up (organisational intervention) also showed a favourable effect on process outcomes. Multiple interventions in which patient education was added or in which the role of the nurse was enhanced also reported favourable effects on patients' health outcomes. Authors' conclusions Multifaceted professional interventions can enhance the performance of health professionals in managing patients with diabetes. Organisational interventions that improve regular prompted recall and review of patients (central computerised tracking systems or nurses who regularly contact the patient) can also improve diabetes management. The addition of patient-oriented interventions can lead to improved patient health outcomes. Nurses can play an important role in patient-oriented interventions, through patient education or facilitating adherence to treatment.

Richerson, S. J. (2003). Effects of diabetes and aging on posture and acceleration thresholds during lateral translations. (Doctoral dissertation, Louisiana Tech University). , 257. (UMI Order #AAI3082021.)

REF ID: 381

QM: Quality Measures

Topic 5: Evaluation/Follow-up

Roubideaux, Y., Buchwald, D., Beals, J., Middlebrook, D., Manson, S., & Muneta, B. et al. (2004). Measuring the quality of diabetes care for older american indians and alaska natives. ***American Journal of Public Health, 94*****(1), 60-65.**

Journal Article, Research, Tables/Charts

OBJECTIVES: This study evaluated the quality of diabetes care for older American Indians and Alaska Natives. METHODS: We analyzed the Indian Health Service Diabetes Care and Outcomes Audit to determine whether completion of indicators of diabetes care differed as a function of age and whether additional patient and program factors were also associated with completion of the majority of the indicators. RESULTS: Completion rates varied by age group, with significantly lower rates seen among the youngest and oldest. Patient diabetes education and duration of diabetes were most strongly associated with the completion of the majority of these indicators. CONCLUSIONS: Further studies are needed to determine effective interventions, including diabetes education, to improve the quality of diabetes care in the youngest and oldest age groups.

REF ID: 369

Level III: Quasi-experimental study

Topic 2: PreventionTopic 1: Risks

Ryan, A. S. (2000). Insulin resistance with aging: Effects of diet and exercise. [review] [187 refs]. *Sports Medicine, 30*(5), 327-346.

Clinical Trial. Controlled Clinical Trial. Journal Article. Review

Insulin resistance, a reduction in the rate of glucose disposal elicited by a given insulin concentration, is present in individuals who are obese, and those with diabetes mellitus, and may develop with aging. Methods which are utilised to measure insulin sensitivity include the hyperinsulinaemic-euglycaemic and hyperglycaemic clamps and the intravenous glucose tolerance tests. Several hormones and regulatory factors affect insulin action and may contribute to the insulin resistance observed in obesity. In addition, abnormal free fatty acid metabolism plays an important role in insulin resistance and the abnormal carbohydrate metabolism seen in individuals who are obese or diabetic. Thus, the mechanisms underlying the development of insulin resistance are multifactorial, and also involve alterations of the insulin signalling pathway. Aging is associated with an increase in bodyweight and fat mass. Not only is abdominal fat associated with hyperinsulinaemia but visceral adiposity is correlated with insulin resistance as well. Modifications of the changes in body composition with aging by diet and exercise training could delay the onset of insulin resistance. Weight loss and aerobic and resistive exercise training result in losses of total body fat and abdominal fat. Several studies report that bodyweight loss increases insulin sensitivity and improves glucose tolerance. In addition, the insulin resistance observed in aged persons can be modified by physical training. Longitudinal studies indicate significant improvements in glucose metabolism with aerobic exercise training in middle-aged and older men and women. Moreover, the improvements in insulin sensitivity with resistive training are similar in magnitude to those achieved with aerobic exercise. The improvements in glucose metabolism after bodyweight loss and exercise training may in some cases be partially attributed to changes in body composition, including reductions in total and central body fat. Yet, additional changes in skeletal muscle, blood flow and other mechanisms likely interact to modify insulin resistance with exercise training. Lifestyle modifications including bodyweight loss and physical activity provide health benefits and functional gains and should be promoted to increase insulin sensitivity and prevent glucose intolerance and type 2 diabetes mellitus in older adults. [References: 187]

REF ID: 353

Level IV: Non-experimental study

Topic 1: Risks

Topic 4.1: Management-General

Shorr, R. I., Franse, L. V., Resnick, H. E., Di Bari, M., Johnson, K. C., & Pahor, M. (2000). Glycemic control of older adults with type 2 diabetes: Findings from the third national health and nutrition examination survey, 1988-1994. *Journal of the American Geriatrics Society, 48*(3), 264-267.

Journal Article, Research, Tables/Charts

BACKGROUND: Although nearly half of all people who have diabetes are aged 65 or older, glycemic control of older adults with diabetes has not been well described. METHODS: We conducted a cross-sectional study of 1,482 participants with self-reported type 2 diabetes in the Third National Health and Nutrition Examination Survey, 1988-1994 (NHANES III), a nationally representative sample of the US noninstitutionalized civilian population. Variables included in this analysis included age, sociodemographic factors, drug treatment, and level of glycemic control. RESULTS: The mean % (+/-SE) HbA1c was 7.78 +/- 0.21, 7.64 +/- 0.18, 7.71 +/- 0.14, and 7.27 +/- 0.14 in persons aged 20 to 54, 55 to 64, 65 to 74 and > or = 75 years, respectively. The mean mg/dL (+/-SE) fasting plasma glucose (FPG) was 175.9 +/- 7.6, 164.5 +/- 6.1, 183.3 +/- 5.3, and 158.5 +/- 5.5 in the four age groups and older, respectively. When controlling for race, gender, education, and duration of diabetes, age was not significantly associated with levels of HbA1c [P (trend) =0.17] or FPG [P (trend) =0.19]. Among NHANES III participants aged 65 or older, ADA guidelines for glycemic control (HbA1c < 7%) were achieved by 71%, 44%, and 27% of persons using no drug therapy, oral hypoglycemic agents, and insulin, respectively. CONCLUSIONS: Although many older adults with type 2 diabetes do not achieve targets for glucose control, there is no evidence to suggest that community-dwelling older adults with diabetes are treated less vigorously than younger persons with diabetes.

REF ID: 360

Level II: Individual experimental study

Topic 4.1: Management-General

Short, K. R., Vittone, J. L., Bigelow, M. L., Proctor, D. N., Rizza, R. A., & Coenen-Schimke, J. M. et al. (2003). Impact of aerobic exercise training on age-related changes in insulin sensitivity and muscle oxidative capacity. *Diabetes, 52*(8), 1888-1896.

Clinical Trial. Journal Article. Randomized Controlled Trial

Insulin resistance increases and muscle oxidative capacity decreases during aging, but lifestyle changes-especially physical activity-may reverse these trends. Here we report the effect of a 16-week aerobic exercise program (n = 65) or control activity (n = 37) performed by men and women aged 21-87 years on insulin sensitivity and muscle mitochondria. Insulin sensitivity, measured by intravenous glucose tolerance test, decreased with age (r = -0.32) and was related to abdominal fat content (r = -0.65). Exercise increased peak oxygen uptake (VO(2peak); 10%), activity of muscle mitochondrial enzymes (citrate synthase and cytochrome c oxidase, 45-76%) and mRNA levels of mitochondrial genes (COX4, ND4, both 66%) and genes involved in mitochondrial biogenesis (PGC-1alpha, 55%; NRF-1, 15%; TFAM, 85%). Exercise also increased muscle GLUT4 mRNA and protein (30-52%) and reduced abdominal fat (5%) and plasma triglycerides (25%). None of these changes were affected by age. In contrast, insulin sensitivity improved in younger people but not in middle-aged or older groups. Thus, the muscle mitochondrial response to 4 months of aerobic exercise training was similar in all age-groups, although the older people did not have an improvement in insulin sensitivity.

REF ID: 341

Level III: Quasi-experimental study

Topic 3: Assessment

Sommerfield, A. J., Deary, I. J., & Frier, B. M. (2004). Acute hyperglycemia alters mood state and impairs cognitive performance in people with type 2 diabetes. *Diabetes Care, 27*(10), 2335-2340.

Journal Article, Research, Tables/Charts

OBJECTIVE: To examine the effects of acute hyperglycemia on cognitive function and mood in people with type 2 diabetes. RESEARCH DESIGN AND METHODS: Twenty subjects with type 2 diabetes, median age 61.5 years (range 53.1-72.0), known duration of diabetes 5.9 years (range 2.8-11.2), BMI 29.8 kg/m2 (range 22.0-34.6), and HbA1c 7.5% (range 6.7-8.4) were studied. Treatment modalities varied from antidiabetic medications to insulin. A hyperinsulinemic glucose clamp was used to maintain arterialized blood glucose at either 4.5 (euglycemia) or 16.5 mmol/l (hyperglycemia) on two occasions in a randomized and counterbalanced fashion. Tests of information processing, immediate and delayed memory, working memory, and attention were administered, along with a mood questionnaire, during each experimental condition. RESULTS: Speed of information processing, working memory, and some aspects of attention were impaired during acute hyperglycemia. Subjects were significantly more dysphoric during hyperglycemia, with reduced energetic arousal and increased sadness and anxiety. CONCLUSIONS: During acute hyperglycemia, cognitive function was impaired and mood state deteriorated in a group of people with type 2 diabetes. These findings are of practical importance because intermittent or chronic hyperglycemia is common in people with type 2 diabetes and may interfere with many daily activities through adverse effects on cognitive function and mood.

REF ID: 337

Level IV: Non-experimental study

Topic 4.1: Management-General

Sousa, V. D., Zauszniewski, J. A., Musil, C. M., McDonald, P., & Milligan, S. E. (2004). Testing a conceptual framework for diabetes self-care management. *Research and Theory for Nursing Practice, 18*(4), 293-316.

Journal Article, Research, Tables/Charts

Diabetes is a major source of morbidity, mortality, and economic expense in the United States. The majority of researchers and clinicians believe that diabetes is a self-care management disease, and that patients should be reliable, capable, and sufficiently responsible to take care of themselves. However, individuals with diabetes may or may not have diabetes knowledge, social support, self-care agency (an

individual's capability to perform self-care actions), and self-efficacy (an individual's beliefs in his or her capability to perform self-care actions) that would help them to engage in diabetes self-care management. Therefore, this study examined the relationship among those factors using a cross-sectional model testing design. A convenient sample of 141 insulin-requiring individuals with either diabetes type 1 or type 2, 21 years old and over, was recruited from an outpatient diabetes care center located in a Southeast region of the United States. Simple linear regression, multiple standard regression, and multiple hierarchical regression were used to analyze the data. Individuals with greater diabetes knowledge had greater self-care agency and self-efficacy. Those with a higher score in social support had greater self-care agency and better diabetes self-care management, and those with greater self-efficacy had better diabetes self-care management. In addition, self-care agency mediated the effects of diabetes knowledge on self-efficacy and the effects of social support on diabetes self-care management. Self-efficacy mediated the effects of self-care agency on diabetes self-care management. Furthermore, the linear combination of diabetes knowledge, social support, self-care agency, and self-efficacy, taken together, positively affected diabetes self-care management. Enhancing an individual's diabetes knowledge, social support, self-care agency, and self-efficacy may be a strategy which can promote better engagement in diabetes self-care.

REF ID: 333

Level IV: Non-experimental study

Topic 3: Assessment

Tsuchiya, M., Suzuki, E., Egawa, K., Nishio, Y., Maegawa, H., & Morikawa, S. et al. (2005). Abnormal peripheral circulation in type 2 diabetic patients with normal ankle-brachial index associates with coronary atherosclerosis, large artery stiffness, and peripheral vascular resistance. ***Diabetes Research and Clinical Practice, 70*****(3), 253-262.**

Journal Article, Research, Tables/Charts

We tested the hypothesis that impaired peripheral circulation in diabetes arises from different aspects of vascular abnormalities even when accompanied by a normal ankle-brachial index (ABI > 0.9). One hundred fourteen type 2 diabetic patients with normal ABI and 33 age-matched non-diabetic subjects consecutively admitted to our hospital were enrolled. The Agatston coronary artery calcium score (CACS), as a marker of coronary atherosclerosis, was obtained using electron-beam computed tomography. An automatic device was used to measure brachial-ankle pulse wave velocity (baPWV) as an index of arterial distensibility. Total flow volume and resistive index (RI), as a marker of peripheral vascular resistance, at the popliteal artery were evaluated using gated two-dimensional cine-mode phase-contrast magnetic resonance imaging. Diabetic patients had baPWV ($P < 0.001$) and RI ($P < 0.001$) higher than those in the non-diabetic subjects, indicating that those parameters are characteristically altered in diabetic patients. When diabetic patients were grouped into three subgroups according to their levels of total flow volume, those with the lowest range showed the highest log-transformed CACS ($P < 0.001$), baPWV ($P < 0.001$), and RI ($P < 0.001$) among the groups. Total flow volume was negatively correlated with log-transformed CACS ($P < 0.001$), baPWV ($P < 0.001$), and RI ($P < 0.001$). Waveform at the popliteal artery could be clearly separated into systolic and early and late diastolic blood flows, which were negatively correlated with log-transformed CACS ($P < 0.001$), RI ($P < 0.001$), and baPWV ($P < 0.001$), respectively. These results suggest that impaired peripheral circulation in diabetes is attributable to coronary atherosclerosis, large artery stiffness, and peripheral vascular resistance even when ABI is normal.

REF ID: 387

Level I: Systematic Reviews

Topic 4.3: Management-Medication

Vijan, S., & Hayward, R. A. (2003). Treatment of hypertension in type 2 diabetes mellitus: Blood pressure goals, choice of agents, and setting priorities in diabetes care. ***Annals of Internal Medicine, 138*****(7), 593-602.**

Journal Article; Meta-Analysis; Review; AIM; IM

BACKGROUND: Hypertension in patients with type 2 diabetes mellitus is a prevalent condition that leads to substantial morbidity and mortality. PURPOSE: To evaluate the goals and optimal agents for treatment of hypertension in type 2 diabetes. DATA SOURCES: Review of the medical literature STUDY SELECTION: Randomized trials that evaluated the pharmacologic treatment of hypertension in patients

with diabetes and reported microvascular and macrovascular outcomes. DATA EXTRACTION: Studies were identified by using the Cochrane Library, MEDLINE, meta-analyses, review articles, and expert recommendation. The searches of the Cochrane Library and MEDLINE were performed in May 2000 and updated in April 2002. Data were abstracted to standardized forms by a single reviewer and were confirmed by a second reviewer. DATA SYNTHESIS: Treatment of hypertension in type 2 diabetes provides dramatic benefit. Target diastolic blood pressures of less than 80 mm Hg appear optimal; systolic targets have not been as rigorously evaluated, but targets of 135 mm Hg or less are reasonable. Studies that compare drug classes do not suggest obviously superior agents. However, it is reasonable to conclude that thiazide diuretics, angiotensin-II receptor blockers, and perhaps angiotensin-converting enzyme (ACE) inhibitors may be the preferred first-line agents for treatment of hypertension in diabetes. beta-Blockers and calcium-channel blockers are more effective than placebo, but they may not be as effective as diuretics, angiotensin-II receptor blockers, or ACE inhibitors; however, study results are inconsistent in this regard. CONCLUSIONS: Treatment of hypertension in type 2 diabetes, with blood pressure goals of 135/80 mm Hg, provides dramatic benefits. Thiazide diuretics, angiotensin II receptor blockers, and ACE inhibitors may be the best first-line treatments, although other agents are usually necessary and goals may not be achieved even with three or four agents. Aggressive blood pressure control may be the most important factor in preventing adverse outcomes in patients with type 2 diabetes.

REF ID: 355

Level III: Quasi-experimental study

Topic 1: Risks

Topic 4.1: Management-General

VoutilainenKaunisto, R. M., Terasvirta, M., Uusitupa, M. I. J., & Niskanen, L. K. (2000). Age-related macular degeneration in newly diagnosed type 2 diabetic patients and control subjects: A 10-year follow-up on evolution, risk factors, and prognostic significance. *Diabetes Care, 23*(11), 1672-1678.

Journal Article, Research, Tables/Charts

OBJECTIVE: To investigate the evolution of visual acuity, age-related macular degeneration (AMD), and its relation to 10-year cardiovascular mortality and risk factors in patients with newly diagnosed type 2 diabetes and control subjects. RESEARCH DESIGN AND METHODS: A 10-year prospective study consisting of a representative group of 133 (70 men, 63 women) newly diagnosed type 2 diabetic patients diagnosed at health centers between 1979 and 1981 and 144 (62 men, 82 women) nondiabetic control subjects recruited from the population register was performed. The frequency of AMD was determined by grading of 45 degrees stereoscopic fundus photographs. The subjects were studied at baseline and after 5 and 10 years. RESULTS: By the 10-year follow-up, visual acuity had declined more markedly in the diabetic patients than in the control subjects. Although the frequency of AMD was nearly the same in both groups (11-19%), it decreased visual acuity earlier in the diabetic patients than in the control group. AMD at baseline predicted 10-year cardiovascular mortality independently of adjustment for other risk factors in the diabetic patients (odds ratio [95% CI] 4.7 [1.1-19.3], P = 0.033). CONCLUSIONS: Visual acuity deteriorated earlier in newly diagnosed type 2 diabetic patients than in the control group although the cross-sectional frequency of AMD was nearly the same in both groups. Interestingly, AMD was an independent risk factor for cardiovascular mortality in type 2 diabetic patients, but the background mechanism(s) behind this association is unknown.

REF ID: 367

Level III: Quasi-experimental study

Topic 2: Prevention

Yanagawa, K., Takeda, H., Egashira, T., Matsumiya, T., Shibuya, T., & Takasaki, M. (2001). Changes in antioxidative mechanisms in elderly patients with non-insulin-dependent diabetes mellitus. investigation of the redox dynamics of alpha-tocopherol in erythrocyte membranes. *Gerontology, 47*(3), 150-157.

Clinical Trial. Controlled Clinical Trial. Journal Article

BACKGROUND: Recently, it has been suggested that the onset and aggravation of diabetes are closely related to free radicals. Also, vitamin E is a lipophilic free radical scavenger that is localized mainly in

biomembranes. OBJECTIVE: The purpose of this study was to clarify the defensive mechanisms against oxidative stress by investigating the differences in the redox dynamics of alpha-tocopherol in plasma and erythrocyte membranes between elderly patients with non-insulin-dependent diabetes mellitus (NIDDM) and healthy elderly subjects. METHODS: Total, alpha-, beta-, gamma- and delta-tocopherol and alpha-tocopherolquinone concentrations were determined by high-performance liquid chromatography with a redox detection mode using a series of four coulometric working electrodes. RESULTS: The alpha-tocopherolquinone/alpha-tocopherol ratio in plasma and erythrocyte membranes was not different between the two groups. Both the alpha-tocopherol concentrations in erythrocyte membranes and ratio of alpha-tocopherol in erythrocyte membranes to alpha- tocopherol in plasma was significantly lower in elderly NIDDM patients than in healthy subjects. CONCLUSION: These findings suggest that alpha-tocopherol is used normally in both plasma and erythrocyte membranes and alpha-tocopherol uptake in erythrocyte membranes is significantly decreased in elderly NIDDM patients. The functional disorder of the antioxidative activity of alpha-tocopherol in erythrocyte membranes due to impairment of this transfer mechanism may be associated with the pathogenesis of NIDDM.